State of North Dakota
DIGITAL ARCHIVES STUDY REPORT

Consultant Recommendations

This document offers recommendations for the authorities, technology infrastructure, strategy, staffing, policy framework, and funding options to establish and sustain a centralized digital preservation repository that will preserve and provide access to electronic government records of permanent historical value.

FINAL

June 3, 2014

Prepared by Tournesol Consulting
Lori Ashley
Charles Dollar
Robert Rogers

Securely Rooted • Forward Facing
Tournesol
Records Management for a Changing Environment

Table of Contents

Tables

Figures

1.0 Introduction

Tournesol Consulting was engaged to analyze the current electronic records management environment in the State of North Dakota and recommend a course of action to establish and sustain a digital archive for government records of permanent historical value managed by the State Historical Society. The final current state assessment report was delivered on April 7, 2014, and this document contains Tournesol recommendations for laying the groundwork for a digital preservation repository that conforms to prevailing standards (ISO 14721 and ISO 16363 among others) and operational good practices.

Capabilities for properly ensuring access to digital content over time, regardless of the challenges of technological change and media failure, are a sophisticated combination of policies, strategies, processes and standards. To determine the suitability and trustworthiness of a digital preservation repository to protect and preserve permanent archival records, many aspects must be considered including:

- Governance, organizational structures and staffing
- Financial fitness and sustainability
- Obligations (mandates, licenses, service level agreements, and liabilities) under which it operates
- Role of records producers and records custodians as stewards of digital objects and their metadata
- Suitability of technical infrastructure and data security
- Risk management and business continuity
- Stakeholders' needs and expectations

Other states have spent a decade or more advancing electronic records management capabilities and none consider their work complete. This report provides specific recommendations to advance the State of North Dakota's efforts to adapt its current practices and technologies to manage the life cycle of electronic records and to establish a digital preservation repository for government records of historical value. Once operational, the repository will require specialized technical expertise and periodic investments to accommodate expansion and management of its digital collections as well as ensure the integrity and viability of the technical infrastructure.

INVEST IN PEOPLE

Create Two New FTE Permanent Positions

- Digital Archivist – State Historical Society
- Electronic Records Analyst – ITD Records Management

Establish Digital Preservation Working Group as a technical domain under Enterprise Architecture

Develop Digital Preservation Strategy

Establish roles and responsibilities for digital preservation of state government records at all appropriate functions and levels, including service level agreements for third party management

Call to Action

Electronic records management and digital preservation are cross-boundary concerns, requiring the involvement of many stakeholders and the coordination of diverse interests and expertise. A digital preservation repository capable of ingesting, managing and ensuring access to permanent government records will require a multi-step initiative and a heightened level of enterprise governance.

From the current state assessment we confirmed that like most other organizations, the State of North Dakota has transitioned to conducting the people's business in primarily digital environments. And while the traditional principles and requirements of records and archives management persist in the digital age, the fragility and dynamic nature of technology requires adopting new ways of getting the job done. Despite the lack of a digital preservation environment the State Archives has begun accepting electronic records from agencies to avoid a gap in the state's cultural history and government accountability.

Tournesol recommends that North Dakota begin as other states have done by hiring digital preservation and electronic records management specialists.

The next priority is to establish a special purpose Digital Preservation Working Group sponsored by ITD and the SHS to tackle the expanding portfolio of electronic records and architect a framework of digital preservation strategies and policies. This Working Group will need to establish electronic records management requirements and guidance as well as initiate education and training to increase awareness and expertise throughout state agencies for how to manage the lifecycle of long-term and permanent electronic government records.

Revisions to select statutes as well as retooling of ITD and SHS policies and procedures to enable a collaborative and proactive approach should also be a priority. Tournesol estimates that focusing on these foundational efforts will require a relatively modest outlay of funding but will take the next two biennia to accomplish.

MODERNIZE PROCESSES

Charter the Digital Preservation Working Group

Adopt a planning horizon of four to six years to fully implement a Level Four preservation repository that can ingest, preserve and provide access to permanent state government records of archival value

Inventory digital information systems and map them to records series

Create profiles of electronic records producing agencies and programs to determine current and future volumes of long-term and permanent series

Update procedures and guidance material to support the efficient transfer of electronic records from agencies to the State Archives

Promote Life Cycle Management

Electronic records management and digital preservation begin when information systems are designed and configured and when records are first created/received. Records Management and Digital Preservation should be elevated to a technical domain so that requirements can be embedded into its service offerings and across the entire technology portfolio. This includes an inventory and the mapping of all current records series managed in electronic format to internally and externally hosted information systems.

During interviews with state employees Tournesol found no fewer than five different uses of the term “archive” ranging from carefully protecting valuable permanent and historical assets for posterity to where to send files when they are no longer needed for active operational use. ITD is the linchpin to harmonizing this terminology across the enterprise and to enabling efficient transfer mechanisms from production environments to officially sanctioned digital preservation repositories.

Expand Collaboration and Interoperability

Tournesol was encouraged by the collaborative efforts of 12 agencies working together on the Geographic Information System (GIS) Technical Committee to build common infrastructure that preserves and provides information to a range of producers and consumers. Those who rely on geospatial information to support business activities understand the value of common standards and shared services better than most users; their successful collaboration represents a potential opportunity to create a preservation repository “test bed” to advance requirements for long-term retention and access.

Tournesol recommends its proposed Digital Preservation Working Group participate as a domain within Enterprise Architecture and support project prioritization efforts of the State Information Technology Advisory Committee (SITAC). Participation and oversight as systems are identified, developed, updated and decommissioned will significantly improve the identification, evaluation, and capture of permanent operational and historical records for managed preservation. It is also critical for ensuring the timely destruction of electronic records that have met their retention so they do not unnecessarily burden applications or state employees.

LEVERAGE TECHNOLOGY

Adopt specifications for an ISO 14721 conforming preservation repository in ITD plans for a sustainable centralized digital preservation environment

Configure and implement an email archive

Establish a Digital Preservation Technical Domain to develop and promote standards, good practices and solutions across the enterprise

Describe and migrate electronic agency records already in the custody of the State Archives to network storage

Promote technology neutral file formats to agencies as a risk mitigation strategy for permanent electronic records and for electronic operational records that must be retained longer than 10 years

Establish and Sustain Preservation Environments

Once an enterprise electronic records management strategy and digital preservation governance framework are established, Tournesol recommends an evaluation of one or more of the conforming repositories available in the marketplace. A pilot project or proof of concept implementation to test transfer, ingest/validation, data management, and access capabilities will help establish a benchmark for the digital preservation repository.

Government records will continue to be deposited into FileNet and other operational content repositories in use around the state. Electronic records deemed to have archival value will be systematically transferred to an ISO-compliant digital preservation repository after their operational use requirements have been met.

It is anticipated that more than one digital preservation repository will eventually be needed to accommodate the diverse nature and requirements of North Dakota state government records of permanent operational and historical value. And while ITD can lead the way in establishing enterprise standards, guidelines, technical systems requirements and interfaces for the State Archives' preservation repository, third party and other distributed environments holding long-term and permanent government records will persist. To protect the interests of its citizens, it will be necessary to significantly strengthen state procurement, project management, and auditing capabilities as well.

A major obstacle to advancing enterprise-level electronic records management and digital preservation is adequate resources in terms of both staffing and funding. Tournesol investigated several funding and financing methods including budgeting and appropriations, fee-for-service revenue, IT project-based funding, agency levies and surcharges, public-private partnerships, and subscription services.

Funding recommendations for the next two biennia to cover costs for personnel, training, consulting, software and storage are offered as the last section of this report.

2.0 Recommendations for 2015-2017 Biennium

2.1 Develop Digital Preservation Strategy

Significant progress in the identification and preservation of digital government records of permanent historical value will require an enterprise-level strategy to manage the life cycle of electronic records and integrate recordkeeping requirements into the hardware and software systems upon which they rely. The State Records Management, Information Technology Department, and the State Historical Society have the responsibility and authority to oversee the executive branch and local government records. State Records Management and the State Historical Society also play a vital advisory role to the legislative and judicial branches.

This section of the report provides recommendations relating to a digital preservation strategy for the State of North Dakota that include:

- Adopt and promulgate a records and information management (RIM) life cycle reference model
- Inventory the State's digital information systems and map records series to the systems that manage them (all media)
- Identify preferred long-term preservation file formats and promote to state agencies
- Develop guidance to state agencies on transferring archival records
- Engage and educate state employees on electronic records management and digital preservation approaches and techniques

2.2 Add Digital Preservation Archivist to SHS Staff

Tournesol recommends adding an experienced Digital Preservation Archivist to the staff of the State Historical Society of North Dakota as soon as possible. The digital preservation archivist will initially focus on designing a long-term preservation strategy and working with State Records Management to build a tactical plan to transfer electronic records from agencies. Over the 2015-2017 biennium s/he can help to evaluate the preservation capabilities of current and proposed applications (ITD, agency, and third party) that manage records series with archival value (currently 2800 records series).

Implementation of a proposed Digital Preservation Working Group (modeled after the GIS Digital Archive Working Group (GDAWG) and the Architecture Review Board) under the auspices of ITD is also recommended. Work targeted for the 2017 - 2019 biennium might require the evaluation of preservation repository solutions but a substantial amount of preparatory work must be completed before selecting any digital preservation repository solution or services.

2.3 Add Dedicated Electronic Records Analyst to ITD Staff

Tournesol recommends that an Electronic Records Analyst be added to the State Records Management team as soon as possible. Working in tandem with the State Archives and other ITD domains, this individual can lead an inventory initiative to map records series (control numbers) to digital information systems in ITD's portfolio. Once templates and processes are designed and tested, ITD can make them available to agencies that are managing their own networks so that a comprehensive, enterprise-wide inventory of records systems can be established. This will aid in identifying state government records of long-term and permanent historical value and ensuring their transfer to the State Archives. The Electronic Records Analyst will also assist the current Records Management staff implement process changes currently in the works as part of the migration of the records retention schedule database and update of record series forms.

2.4 Integrate Digital Preservation Domain into Enterprise Architecture Governance

The mission of Enterprise Architecture (EA) is to provide a process for setting common goals and delivering information technology services to state government. EA is made up of technical domains and relies on collaboration and consensus building among agencies to design, implement and maintain infrastructure. EA works with the State Information Technology Advisory Committee (SITAC) to promote collaboration between and among ITD stakeholders. **Tournesol recommends that Digital Preservation be added as a technical domain within Enterprise Architecture (**Figure 1 below**) and a dedicated cross-functional working group ("Digital Preservation Working Group") be established to establish requirements and promote good practices across the state enterprise.** This action will help to ensure that a standards-based centralized preservation environment is established and sustained under the auspices of Enterprise Architecture.

Many of the existing statutes, guidelines, policies, and practices that govern the activities of the State Archives, the Information Technology Department, and other state entities do not provide a sufficiently robust mandate to meet the challenges of electronic records management and advance the establishment of a conforming ISO 14721 digital preservation repository for permanent government records of historical value. Suggestions to strengthen and improve the integration of State Records Management, Information Technology Department, and the State Archives are provided in Appendix C.

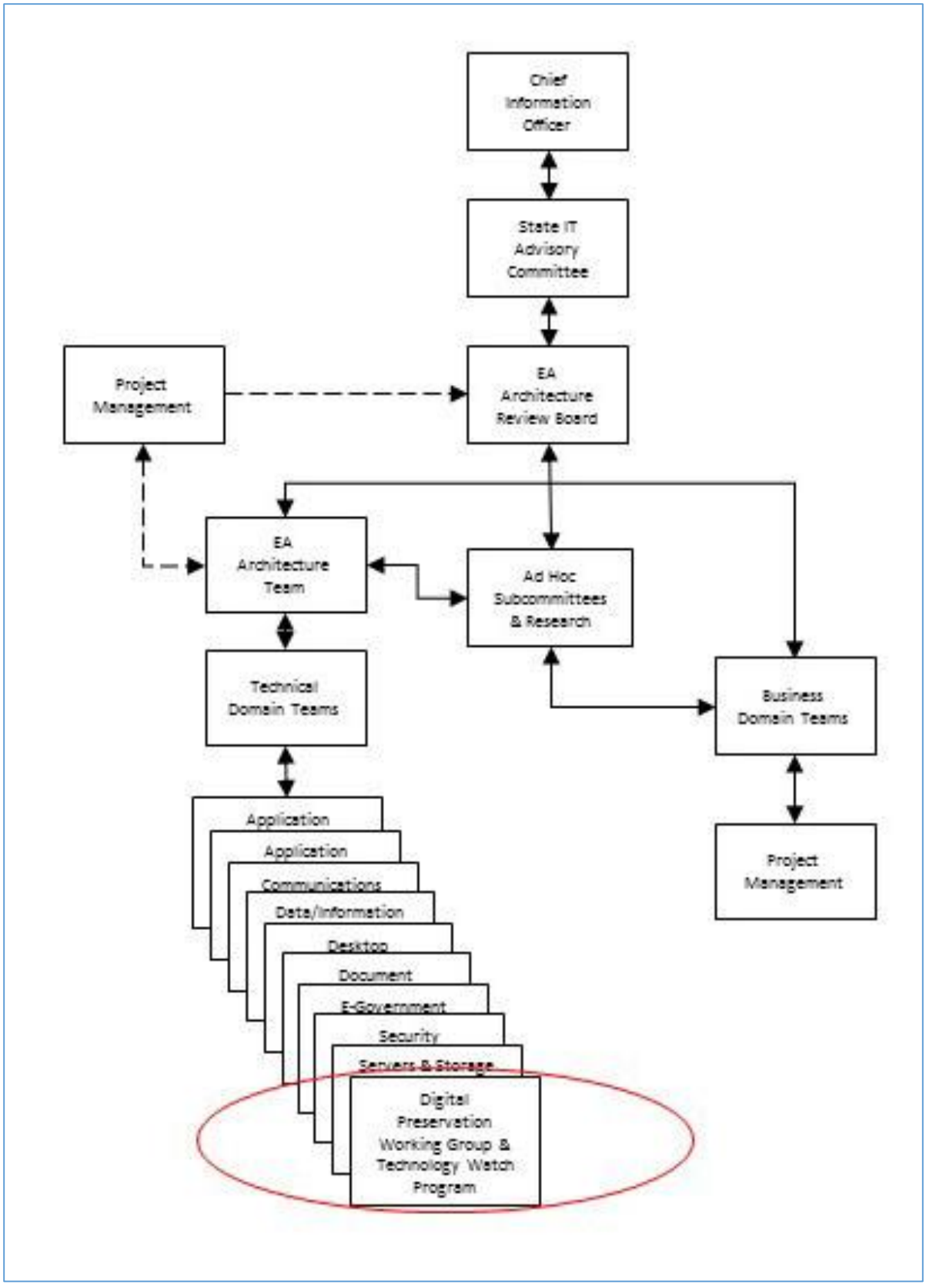

Figure 1. Proposed Digital Preservation Technical Domain

2.5 Adopt and Promote an Information and Records Life Cycle Management Model

Tournesol recommends that ITD and SHS identify and promulgate a life cycle management model for state government data, information and records. This is a critical but not difficult first step in establishing a reference model for stakeholders to use to share perspectives, identify requirements and interdependencies, explore impacts, and update records management practices.

There are many life cycle models used to describe records management and data preservation. Three life cycle models that can be applied to the State of North Dakota are provided in Appendix D.

Tournesol recommends that establishing consensus on a life cycle reference model be undertaken as one of the first outcomes by the proposed Digital Preservation Working Group. Establishing a model will support training as well as dialogue with the record producing government agencies and entities to determine at what point in the lifecycle of specific records they can be ingested into the digital preservation repository.

2.6 Inventory Digital Information Systems and Map to Record Series

In conjunction with the roll-out of a lifecycle management model for state government records, training on e-records fundamentals should be made available to agency heads, records and IT coordinators, and program managers. Once engaged, these stakeholders will be positioned to support State Records Management and ITD in the development of a comprehensive inventory of state agencies' applications and how they map to records series.

State Records Management's current initiative to update the Records Series and Records Inventory forms provides an unprecedented opportunity to establish the capability to capture and retain linkages between series and systems. Tournesol recommends that State Records Management supplement the updated forms and changes to procedures and guidelines with a new form for scheduling structured systems.

Once records series have been mapped to systems used by agencies and local government entities, the State Archivist and Digital Preservation Archivist can begin in earnest to engage with ITD Enterprise Architecture and with agency IT and records coordinators to strategize about the transfer of archival records.

2.7 Update Appraisal and Scheduling Techniques for Electronic Records of Permanent Value

The selection and acquisition of electronic records by the State Archives must be viewed within the context of how paper records are selected and acquired. Agency Records Coordinators identify records series produced and managed by their agencies and work with State Records Management to establish retention and disposition rule. During a review of records retention schedules the State Archivist may indicate certain series have "archival value." The Information Management Analysts address the total administrative, audit, legal and archival value in finalizing the retention requirements and specifying transfer (disposition) requirements.

Currently, very few Agency Records Coordinators have mapped record series now managed in electronic format to a specific system or application. ITD does not currently have visibility into how records series and requirements relate to most of the systems it manages. A case in point: identifying permanent records series currently stored in FileNet for the current state assessment is a manual process. Hence, the majority of electronic records in the custody of state agencies and potentially third parties have not been mapped to an approved records retention schedule. In the absence of mapping where state government records are being managed, it is labor intensive to apply retention and disposition rules.

The challenges of successfully dealing with electronic records of permanent historical value are exacerbated as long as they remain in the custody of the agencies that created or received them. As a practical matter, the State Archives should pre-accession copies of electronic records of historical value soon after their creation or receipt. Undoubtedly, many of these records still may have operational business value but copies can be transferred to the custody of the State Archives where they can be stored in a proper archives environment. This has the added advantage of maintaining a backup copy of the electronic records for the benefit of state agencies.

Specific recommendations relating to the scheduling and acquisition of electronic records of permanent historical value include:

- Map records series as they currently exist using a Records Control Number to specific locations where electronic records are stored (e.g., FileNet or Outlook) and thereby identify records of historical value along with records that may be officially destroyed after the elapse of a specified period of time
- Provide training to ITD and State Archives staff on how to map record series to digital information systems and advise agencies on how to assign records retention periods to electronic records at or near the time of their creation and receipt
- On a day forward basis assign records retention and disposition rule to electronic records at or near the time they are created or received
- Identify preferred preservation file formats and encourage state agencies to convert electronic records of historical value to one of these formats as early in the life cycle of the records as possible
- Crawl networks and other digital repositories to identify official electronic records of historical value and purge duplicate copies as appropriate

- Copy relational database tables that contain electronic records of historical value and "prune" the tables to remove information that does not require long-term preservation. Transfer the tables to interoperable standards based relational database schema or produce a PDF report from the tables that can be saved in a fixed format
- Encourage state agencies to transfer copies of electronic records of historical value to the State Archives soon after their creation and receipt

2.8 Migrate Electronic Records Accepted by State Archives to Network Storage

As discussed in Section Five on projected volume of electronic records accepted by the State Archives, the types of digital media submitted by state agencies have a relatively short shelf life. **Tournesol recommends instituting a short-term program to catalog and then migrate these files to storage media than can be backed-up and managed more effectively.** Two and one half terabytes is a relatively modest amount of storage, but the number of files that could occupy 2.5TB is potentially a very large number. Without creating a Submission Information Package[1] (SIP) to describe the records the risk of loss is significant.

Most all of the cost and effort associated with preserving this information will derive from the processing, cataloging, and migration of these files to other storage resources. **Tournesol recommends using a student intern to perform this task assuming the procedure is sufficiently well documented.** Tournesol would be pleased to create such a procedure with a project change request.

2.9 Proactively Address Archives Ambiguity through Education and Engagement

Archive and archiving (the verb form of archive) are inconsistently used terms that should be proactively addressed because of the current risk-driven compliance and litigious business environment. While the ambiguity of the term "archive" in North Dakota was expected, the discontinuity arising from such ambiguity has a profound effect on the preservation of information within the State that must be addressed by ITD and the State Historical Society.

The transformation is being driven by a changing use model that makes all electronically stored information ("ESI") including content preserved long-term, subject to legal discovery. ESI must be able to be located, indexed, and controlled. The practices of "retention and preservation" more precisely define the current information governance requirements than does "archive." Retention is applicable because all data, information and records should have an approved and enforceable retention policy that may range from short-term to long-term or even to forever. Consequently, the concept of 'archiving' as a separate practice often performed when information is no longer considered 'active' or an 'archive' as a unique collection of assets can be replaced by 'retention and preservation' for all the information and data. Given the scale and complexity of information in data centers, legal and security requirements as well

[1] An Information Package that is delivered by the Records Producer to the OAIS for use in the construction of one or more AIPs.

as business risk considerations mandate that electronically stored information be preserved and remain accessible over authorized retention periods.

Examples of current uses of “archive” and “archiving” that represent risk and liability for the State of North Dakota and other public sector entities include:

Email Archives	Back up and Hierarchical Storage
The original purpose for email archive systems was to capture copies of emails and associated attachments (upon transmission and after delivery), instant messaging, and other data types and store them in a dedicated repository that had preservation, discovery, and protection attributes. These repositories are now commonly being used for retaining other information types for compliance, eDiscovery, and long-term preservation because they meet the criteria for a preservation repository and are more than just an ‘email archive.’	Typical misuses of the term archiving often include creating copies of data for the purpose of backup or moving information from a Tier-1 or Tier-2 array into a Tier-3 tape system to reduce cost or power consumption (called “tiering”) or to compress and/or move information to save storage space and improve disk performance (an activity called capacity optimization). Database Administrators often use the term archiving to refer to moving unused or legacy information from an active database to improve performance. These services and the associated stores do not meet the requirements of preservation. They do not define or utilize an archive.

Table 1. Common Uses of "Archive" and "Archiving"

All of these ambiguous uses of the term “archive” and “archiving” were in common use by State agencies engaged in interviews about current records management practices. The “archive as a backup” was especially prevalent with an interesting twist in the case of more than one agency: an inventory of paper records are being scanned and uploaded into an electronic repository and the paper copies transferred to the State Archives. The justification for this tactic was often to save space and in some instances to improve access.

Regardless of the justification, the process complicates the identification of what constituted the authoritative record (i.e., electronic or paper copy). The usual industry convention would be to convert the authoritative record from paper to electronic format and destroy the paper unless there was historic significance to the paper (in which case it would retain its authoritative value).

Tournesol recommends that ITD, State Records Management and the State Archivist work together to develop training and communications materials that address this ambiguity. It is also expected that updates to ITD and SHS policies, procedures, guidelines and standards will help to ameliorate the current situation and advance digital preservation objectives.

2.10 Configure and Implement Email Archive

Transfer of email to a preservation repository will require automation for efficiency and thoroughness. **Tournesol recommends implementing an email archive to eliminate the ad hoc processes staff members use to manage email for records retention and reference purposes**. Email records with permanent or historical value, such as those in the Office of the Governor, could then be transferred from the email archive directly to the permanent repository at the appropriate time.

ITD has licensed and installed most of the software components needed to implement an archival repository for email. IBM's FileNet, Content Manager, and Content Collector provide the basis for capturing and recording email (see Figure 2 on the next page). **Error! Reference source not found.**

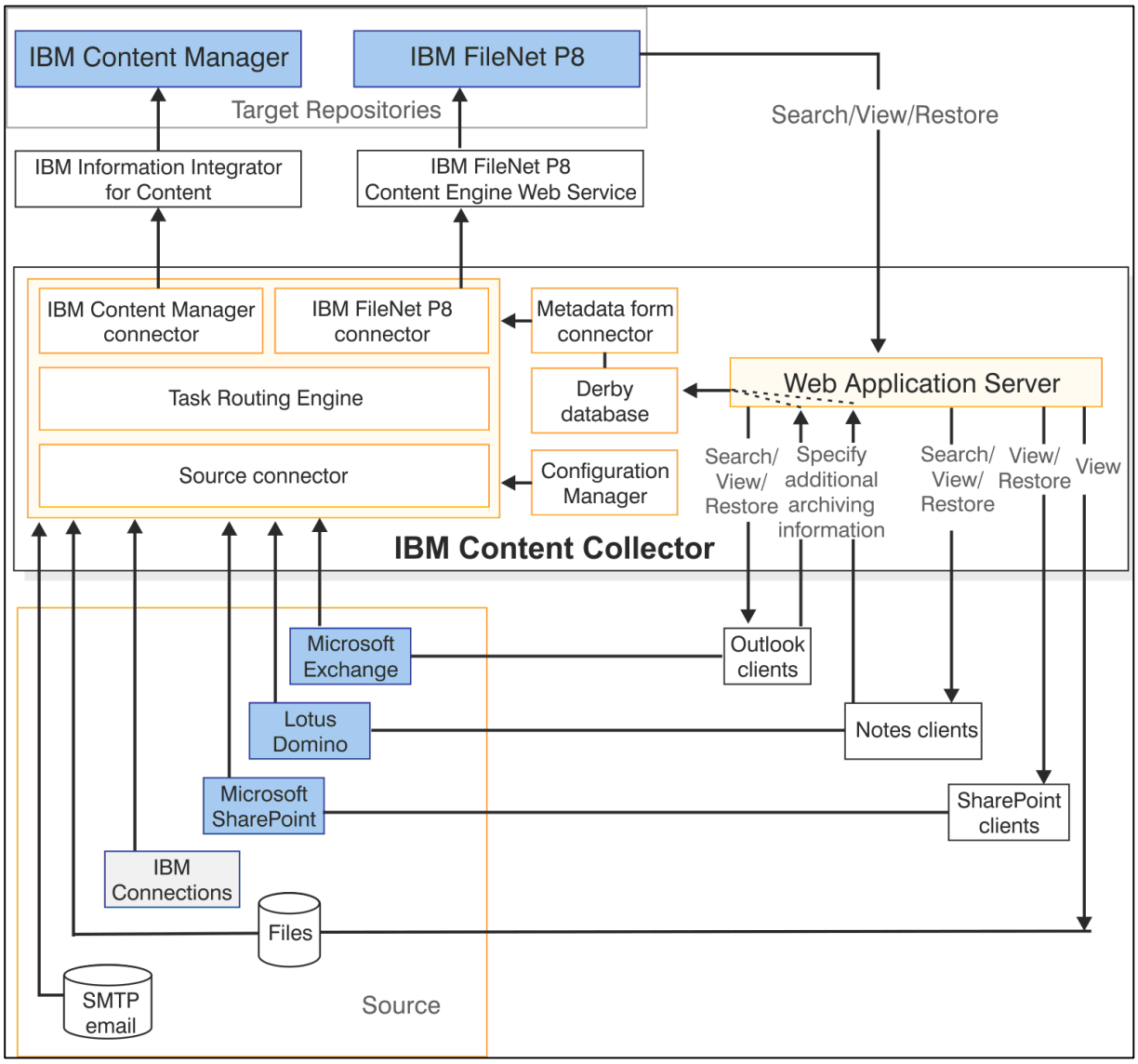

Figure 2. IBM Configured Archival Repository for Email

2.11 Initiate Development of Digital Preservation Policy Framework

The mission of the State Historical Society is *to identify, preserve, interpret, and promote the heritage of North Dakota and its people.* The State Archives Division collects, manages and references documentary resources relating to state history and culture. The Division is the official state archives, preserving North Dakota government records of enduring value. Its extensive collections also include the state's official newspapers, books, photographs, maps, manuscript collections and audiovisual materials.

As confirmed in the Current State Assessment, the transition to a digital government is well underway in the State of North Dakota. Practices and standards to ensure the preservation of government records of permanent value to its citizens that may only exist in digital format, however, have not kept pace. In order to protect the rights and obligations of the state and its citizens, hold government accountable for its actions, and help document the intellectual and cultural heritage of the state, it is necessary to raise the level of visibility and accountability for the life cycle management of electronic records. At the same time it is necessary to integrate considerations to ensure long-term and permanent records managed in digital formats are accessible, usable, understandable, and trustworthy far as long into the future as required.

Tournesol recommends that the proposed Working Group begin work on a draft digital preservation policy framework during the 2015-17 biennium. Ideally this work would begin immediately after the arrival of a Digital Preservation Archivist to the staff of the State Historical Society.

A digital preservation policy framework will govern the establishment and operation of a digital preservation repository that is capable of ensuring the accessibility, usability, and authenticity of electronic records of the North Dakota State government deemed to have permanent historical value across successive generations of information technology, State employees, and citizens. At the same time it should be "aspirational" in the sense that it expresses the intention to move from a current state of digital preservation capability to a desired future state. It should be given the highest level of public visibility through endorsement of civic and political leadership in the state.

Figure 3. IBM Content Collector major components and interactions (Source:"Creating Value-Based Archiving Solutions with IBM Content Collector" - SG24-8078)

Tournesol recommends that key features of the policy framework include:

- Identify through systematic archival appraisal digital content of long-term value that must be preserved across generations of technologies
- Establish and sustain a digital preservation environment that implements tools, technologies and strategies to mitigate technology obsolescence that over time can render digital content unreadable, unusable, and untrustworthy
- Comply with prevailing international and community standards for digital preservation and access
- Encompass historical material that originates in digital form as well as historical assets converted to digital form
- Protect North Dakota investments in its employees, business processes and technologies through a statewide digital preservation program that promotes collaboration with agencies and local government

- Demonstrate organizational commitment through the identification of and promulgation of a sustainable digital preservation strategy and funding
- Identify roles and responsibilities of state digital preservation stakeholders and the means to hold them accountable for protection of permanent government records
- Identify the role and responsibilities of the digital preservation repository system operator

Figure 4 depicts a conceptual model for cross-functional collaboration and consensus-building that is focused on identifying digital preservation requirements and developing efficient enterprise strategies for addressing the threat of technology obsolescence across systems and over time.

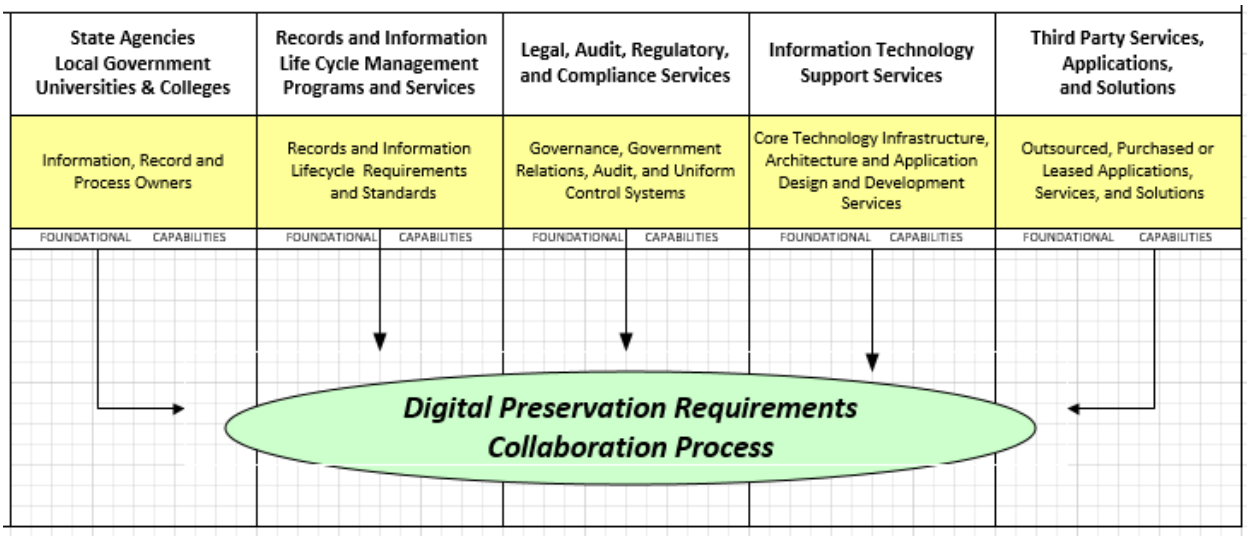

Figure 4. Digital Preservation Requirements Collaboration Framework

North Dakota should be able to leverage the work of other states[2] as well as the digital archives and electronic records management guidance published on the Resource Center[3] of the Council of State Archivists (CoSA) to advance development of a Digital Preservation Policy Framework.

To be fully accepted by state agencies the North Dakota Digital Preservation Policy Framework must be robust and understandable, have a high level of public visibility and be adaptable to emerging technologies, changing agency operation practices and requirements, and new digital preservation community standards and practices. These overall requirements are directly linked to the questions of who issues the Policy Framework and how it is periodically updated.

Tournesol offers the following high level recommendations for the development and maintenance of a North Dakota State Government Digital Preservation Policy Framework:

- Engage third party digital preservation experts to work with the State Archivist to oversee the drafting of a Digital Preservation Policy Framework

[2] Kentucky, North Carolina, Kansas, Wyoming and Utah have developed Digital Preservation Policy Frameworks.
[3] http://rc.statearchivists.org/Default.aspx

- Submit the draft to the Digital Preservation Working Group for review and endorsement
- The State Archivist recommends that the ITD CIO and the Director of the State Historical jointly issue the Digital Preservation Policy Framework
- On at least a biannual basis the State Archivist initiates a review of the Digital Preservation Policy Framework in consultation with ITD and state agencies
- The Digital Preservation Working Group endorses recommended changes
- The ITD CIO and Director of the State Historical Society jointly issue a revised Digital Preservation Policy Framework

3.0 Preservation Environment Recommendations

Once an enterprise electronic records management strategy and digital preservation governance framework are established, Tournesol recommends the plans get underway to establish the technical architecture and infrastructure requirements for a preservation environment managed by ITD. This section identifies recommendations relating to technology platforms and protocols required for long-term preservation and access to electronic state government records of permanent value.

3.1 Establish Centralized Standards-Based Digital Preservation Repository for State Government Records of Historical Value

In the current state assessment Tournesol Consulting described four levels of digital repositories that are likely to exist in most contemporary organizations. Level Four stipulates a special purpose repository which performs a long-term information preservation and access function and has relationships with records producers[4] as well as consumers[5] ("Designated Community"). It is this type of repository that is required for the North Dakota State Archives to fulfill its Century Code 55-02.1 mandates.

Tournesol further characterizes a Level Four digital repository as adhering to a set of international standards that support the accessibility, usability, authenticity and trustworthiness of electronic records for as long into the future as may be required. Essentially, this means that a Level Four digital repository should have the resources and capabilities to provide these services across time and generations of technologies for a changing user community. This set of international standards minimally includes:

- ISO 14721:2012, Open Archival Information System (OAIS)
- ISO 16363:2012, Audit and Certification of Trustworthy Digital Repositories
- Library of Congress PREMIS, Preservation Metadata Implementation Strategies
- ISO 20652:2006, Producer-Archive—Interface Methodology Abstract, and
- ISO 27002:2013, Information Technology—Security Techniques—Code of Practice for Information Security Controls

Combined, these standards establish a high level specification for an archive, consisting of an organization of people and systems that has accepted the responsibility to preserve information and make it available indefinitely. The full range of functions include ingest, archival storage, data management, access, and dissemination. In addition to the required organizational infrastructure, this repository demands continuous digital object management and robust storage technologies, technical infrastructure, and security.

[4] Records producers are individuals, entities or systems who provide information to be preserved and can include internal or external persons or systems.

[5] An identified group of potential consumers who should be able to understand a particular set of information. The Designated Community may be composed of multiple user communities.

Most organizations that aspire to the capabilities of a Level Four digital repository focus initially on building the necessary organizational commitment and securing specialized resources to manage the life cycle of electronic records including those with permanent retention value. In essence this means that the strategy and policy groundwork must be laid before the technical infrastructure and the preservation techniques and services can be implemented. This process may take several biennia under the best of circumstances. **Tournesol recommends that ITD adopt specifications for a Level Four digital repository in their plans for a sustainable centralized digital preservation environment, and ITD and SHS adopt a planning horizon of four to six years to fully implement a Level Four preservation repository that can ingest, preserve and provide access to permanent state government records of archival value.**

3.2 Technical Staffing for the Preservation Environment

Staffing within ITD to support electronic records is currently concentrated in Records Management and Electronic Document Management (four FTEs). Other ITD staff members contribute by provisioning storage, operating backup and recovery systems, and maintaining the infrastructure needed to provide services. Some in-house development related to FileNet has also been performed.

It is highly likely that additional technical staff will be needed as the preservation environment for permanent electronic records is developed. For example, the Washington State Archives created the full-time staff position of Ingestion Coordinator to address the diversity of formats and requirements associated with new acquisitions into their Digital Archives (Table 2). Duties for this new position included adding agencies and collections, creating user accounts, managing users and access levels, managing collections, controlling ingestion, moving data to backup tape, and generating reports about records ingested.

A significant number of in-house tools were also needed at the Washington State Archives. A team of architects, developers, and administrators were required to create and manage these systems and services. The same type of in-house tools are likely to be required to support the North Dakota preservation repository as well as any specialized transfer tools for the current FileNet environment.

Following the example provided by the State of Washington, it may be advantageous to have a Technology Consultant position that serves as an advocate for ITD electronic records and represent the management of permanent state government records to the Architecture Review Board and other technology committees. This role could help to ensure the sustainability and reliability of the North Dakota preservation environment.

Table 2. Example of a Digital Archive IT Support Team (Source: States of Sustainability: A Review of State Projects funded by NDIIPP)

ROLE	JOB DUTIES
Project Manager	▪ Overall management of project activities
Technology Consultant	▪ Researches and evaluates computer hardware and software issues related to digital records ▪ Provides recommendations on policies and procedures ▪ Serves as representative on technology committees
Chief Applications Architect	▪ Oversight of the development team
Application Developer	▪ Web indexing portal development
Application Developer	▪ Website interfaces
Application Developer	▪ Ingestion coder
Ingestion Coordinator	▪ Training ▪ Coordination of data ▪ Maintenance development
Ingestion Coordinator	▪ Create/Manage user accounts and access levels ▪ Add agencies ▪ Add/Manage collections ▪ Control ingestion ▪ Move data to backup tape ▪ Reporting on what was ingested
Network Administrator	▪ Support network infrastructure ▪ Coordinate routine maintenance ▪ Implement infrastructure changes
Database Administrator	▪ Database backups and administration
Senior Database Developer	▪ Database design and optimization

Descriptions of current technical staff duties and performance expectations provided by the Kentucky Department for Libraries and Archives (KDLA) are provided as Table 3 and Table 4 on the next two pages.

Table 3. Sample Technology Consultant Position Description (Source: KDLA)

DUTIES	PERFORMANCE EXPECTATIONS
Manages and develops the Electronic Records Archives web site, including web mark-up, search mechanisms, and site maintenance. Assists with web site implementation.	Coordinates technical support and manages the web site for the Electronic Records Archives including description of records on web pages and development of DSpace in accordance with standards. Serves on the State Historical Records Advisory Board. Develops skill in using web editing tools and working with the Web Team to modify the web site and social networking page. Manages ArchiveIt web harvesting and shares management of the Preservica cloud application with the branch manager.
Researches and evaluates computer hardware and software issues related to electronic records. Provides input on the development of policy options. Serves on technology committees	Participates in preservation projects including SERI and NDSA. Participates in the development of the electronic records preservation plan. Serves on the Electronic Records Working Group and assists other TAS staff in work group activities. Advises the General Schedule Records committee on electronic record issues.
Uses specialized software tools to analyze, appraise, transfer, and accession electronic public records. Assists archival / record managers and library personnel in the resolution of problems relating to electronic record appraisal and management	Works with Records Analysts, agency Records Officers, and agency technical personnel, to appraise electronic records for transfer to the Electronic Records Archives, accession records, and generate reports. Accessions records from the agency web sites.
Provides some technical support to staff when other staff are not available	Responds to technical support questions when necessary and assists in upgrade of PRD computers.
Uses specialized software tools to convert, validate, and preserve records in an Electronic Records Archives using a variety of automated techniques.	Demonstrates skill with search and replace, validation, conversion and preservation software in order to develop and regularly perform procedures using that software.

Table 4. Sample Resource Management Analyst Position Description (Source: KDLA)

DUTIES	PERFORMANCE EXPECTATIONS
Analyzes record keeping electronic systems through the records retention scheduling and system description processes.	Work with state and local branches in scheduling electronic records and maintaining an inventory and description of electronic systems. Make presentations to the Archives and Records Commission regarding the scheduling of electronic records.
Works closely with agency records officers to insure that information systems are managed in accordance with public records laws	Explain the scheduling and guidelines for electronic records to records officers and data processing staff. Identify electronic records that are archival and assist in their placement in the data archive.
Advises program managers & other personnel regarding information technology's impact on the department's internal electronic records program and to the life cycle management of electronic records with state information technology standards. Respond to questions from agencies regarding electronic records issues. Work with other staff to develop records management guidelines with respect to electronic records. Work with agencies to implement records management in their systems.	Contribute to the development of an electronic records preservation strategy. Respond to questions from agencies regarding electronic records issues. Work with other staff to develop records management guidelines with respect to electronic records. Work with agencies to implement records management in their systems.
Recommends changes in policies, guidelines, and standards for presentation to agency and provides some technical and research support to staff when other staff not available executives.	Assist the Electronic Records Work Group by researching issues, developing draft positions, and compiling the meeting minutes. Advise open records staff on technical issues. Provide support to the Legislative Review process and multi-state electronic records projects. Increases experience with policy and standards through participation in SERI Co- Chair activity.
Provides some technical and research support to staff when other staff not available.	Respond to technical support questions when necessary and work in the research room on a limited basis and assist with promotion of genealogical resources.
Promotes use of state-wide information resource management or electronic records guidelines/policies and technology standards through training and creation of instructional materials	Work with others on development of training tools for managing of electronic records including both web based and in person presentations. Learns from participating in a SERI educational grant.

3.3 Implement ISO 14721 Conforming Preservation Repository

The State of North Dakota included the requirement for recommendations on technology platform options in the Digital Archives Study final report. A preservation environment has unique requirements and is distinct from a typical business application. Many commercial products advertise their capability to "archive" data. The Tivoli Storage Manager (licensed to ITD) has an archive capability. The Linear Tape File System (LTFS) was built to store data for a long time with a high level of availability; however, neither of these constitutes a preservation environment.

Tournesol advocates the addition of specialized expertise to the staffs of ITD and SHS as well as the development of several key instruments (life cycle model, updated standards and statutes, electronic records management strategy, and digital preservation policy framework) before a digital preservation repository is designed and implemented. A preservation environment requires the utmost capabilities of data protection, constant monitoring, and careful documentation of every aspect of its operations to prove that data are valid and authentic not just after decades have passed, but after many complete staff turnovers, equipment upgrades, moves to new data centers, and format transformations.

This section of the report provides an overview of the required digital preservation environment including security measures and technical and procedural suitability. A brief discussion on transfer mechanisms from operational environments to the digital preservation repository is included and relates to earlier recommendations to inventory the State's information systems and map records series so that formal submission agreements and standards can be established. The final topic in this section is a discussion on technology obsolescence and recommendations for device/media renewal and development of a technology and file format monitoring capability. This will be a shared responsibility of ITD and the State Historical Society.

A digital preservation repository that conforms to ISO 14721 and the other prevailing standards could be hosted by ITD, cloud-based, or a hybrid implementation. A hybrid implementation could satisfy confidentiality and protection requirements potentially imposed by the State and yet provide the benefits (e.g., elasticity and resilience) of a cloud-based solution.

The economics of hosting digital repositories are changing rapidly. Cloud-based solutions are declining in cost and quality of service is improving. Google and Amazon both announced significant price cuts in March 2014 for cloud services (Amazon's Elastic Compute Cloud pricing dropped 40%) and prices are expected to continue to decline. Cloud-based solutions for Geographic Information Systems ("Cloud GIS") and ISO 14721 repositories[6] are currently available today. Furthermore, given the strategic priority that ITD has set for delivering cloud-based services,[7] it is not unreasonable to expect that ITD might be prepared to support its own private cloud over the next biennium.

[6] Tessella's Preservica is a cloud-based ingest and storage repository. Links to this offering and other digital preservation platforms are provided in Appendix A.
[7] 2013-2015 Information Technology Department Strategic Plan.

The design of the State of North Dakota digital preservation repository should consist of multiple environments. As many as three copies of the digital objects held by the preservation repository may be required. Just as it is standard operating procedure to stand up development/test, staging, and production environments, an organization building a preservation environment can expect to establish staging, preservation master, and public access environments. The GeoMapp diagram below (Figure 5) offers a graphical representation of a preservation environment.

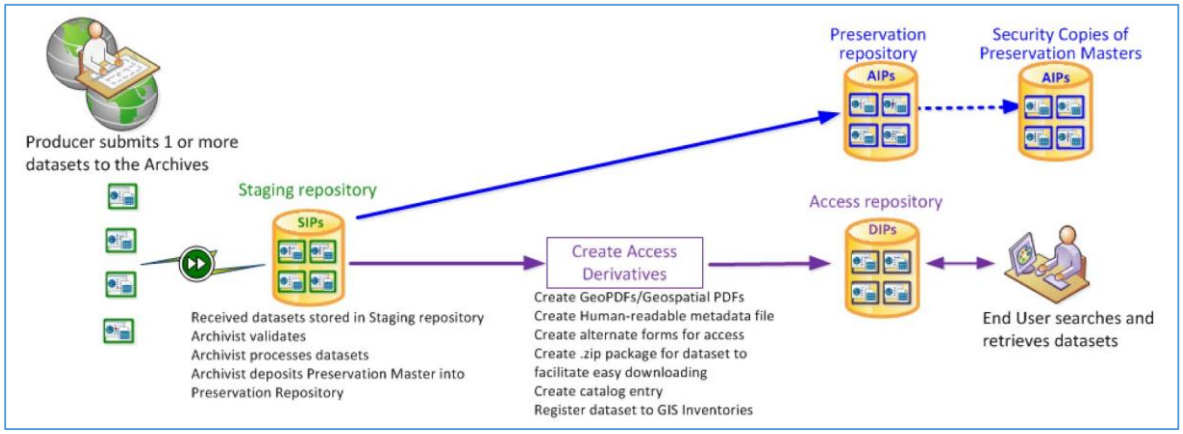

Figure 5. Preservation Environments (Source: GeoMAPP "Best Practices for Archival Processing for Geospatial Datasets")

3.3.1 Develop Preservation Environment Specifications

An ISO 14721 conforming digital repository has a similar preservation environment: Staging, Storage, and Dissemination.

The purpose of Staging is to create a work area for:

- Receiving electronic records (Submission Information Packets or SIPs) from producers (state agencies and local government entities),
- Validation of digital objects to ensure the materials meet submission standards,
- Preparation of the datasets and metadata for long-term preservation, and
- Creation of Archival Information Packages (AIPs) for transfer to Archival Storage.

The purpose of Archival Storage is to preserve Archival Information Packages (AIPs) and:

- Conduct periodic device/media renewal and format transformations,
- Collect and maintain metadata associated with digital preservation activities that support an electronic chain of custody, and
- Protect the physical security of AIPs from tampering, corruption, or natural disaster through geographically dispersed, firewall-protected repositories, and periodic audits of conformance to OAIS specifications.

The function of Dissemination is to ensure access to the information in AIPs, including:

- Protection of AIPs from direct public access,
- Creation of publicly available descriptive material (e.g., an inventory or finding aid) about the content of AIPS that may be searched, and

- Production of Dissemination Information Packages (DIPs) in alternative presentation formats (e.g., PDF, TIFF, HTML, and low resolution/high resolution images as appropriate) in response to user requests.

3.3.2 Conduct Periodic System Operator and Preservation Environment Audits

For a preservation environment capable of protecting and providing access to permanent electronic records two types of audit processes are applicable. ISO 16363:2012, Audit and certification of trustworthy repositories, defines a recommended assessment practice that is applicable to the entire range of repositories.[8] ISO 16363 takes a stewardship approach to assessing an organization's ability to operate a trustworthy digital repository. Assessing an organization's ability to operate a preservation repository concentrates on staffing, contractual obligations, financial sustainability as well as governance of digital objects and risk management.

The second type of audit applicable to the preservation environment is based on information privacy and security controls (either ISO 27002:2012 or NIST SP 800-53). An information security audit focuses on threats, vulnerabilities, and countermeasures by assessing system access controls, authentication, and authorization.

There is some overlap between the two types of audits (i.e., ISO 16363 contains a section to evaluate Infrastructure and Security Risk). Combining elements of these audit assessments will enable a robust characterization of the entire preservation environment once North Dakota's digital preservation repository is operational.

3.3.3 Ensure Long-Term Storage and Procedural Suitability

There are many types of technology deployed for data storage in operational and preservation environments. Electro-mechanical devices such as disk drives are designed for a relatively short duty cycle (e.g., usually seven years or less). Magnetic tape has a duty cycle that usually depends on its frequency of use and its "shelf time" (e.g., how long the tape remained unused and the condition of the magnetic oxide layer; generally 15 years or less). CD-ROM and DVD's storage also deteriorate with time (e.g., de-lamination). Using a hardware technology that doesn't deteriorate, however does not lessen the opportunity for data loss because data formats and software also change rapidly.

Storage environments performing long-term preservation of Archival Information Packets (AIPs) require constant care and attention to monitor hardware and software for technological obsolescence, environmental issues affecting hardware, serviceability, deprecated data formats, or software that requires resources that are no longer available. Information architects and repository system operators have developed specialized tools to inspect archival assets for these types of issues. Without procedures

[8] In June/July 2011 the Kentucky Department of Library and Archives (KDLA) underwent a test audit of their digital preservation repository. The purpose of the test audit was to help refine the audit process as part of the final preparations of the ISO 16363 standard.

and processes to ensure that the repository can demonstrate the integrity of archival objects and proper use and maintenance of inspection tools, however, data loss is inevitable.

The digital preservation repository must be able to demonstrate that it can react and adapt based on monitoring information about its collections, changing circumstances, and technological changes. This includes the ability to respond to inevitable changes in any international or community standards relied upon by the repository.

3.3.4 Implement Security in the Preservation Environment

As previously stated, using either ISO 27002 or NIST SP800-53 as the basis for security controls is an important consideration. Both of these security methodologies address monitoring, logging, and the use of checksums and hash totals. The terminology and techniques differ between preservation (i.e., fixity) and information security (e.g., encryption); but both are addressing the same issue of data integrity. A preservation environment entails using the most robust levels of monitoring and logging (including authorized changes) to help ensure the authenticity and integrity of the archival materials. To further ensure the integrity of the preservation environment, multiple preservation masters are often used to identify and eliminate data corruption by automatically comparing and validating objects across masters.

3.3.5 Design and Test Submission Information Packages (Ingest)

A fundamental prerequisite for a digital preservation repository is to establish the protocols, procedures, and digital community best practices that support ingest of electronic records. This work requires specialized expertise and is likely to take upward of two years to fully develop and validate. Nonetheless, this is a good investment of resources because the absence of carefully designed and tested submission protocols and procedures will result in the transfer of electronic records from agencies to the digital preservation repository being cumbersome and impossible to automate. Given the volume of anticipated electronic records transfers over time, this could represent a serious threat to the State Archives.

To mitigate this possibility Tournesol recommends:

- Design of Ingest Submission Information Packages (SIP) protocols, procedures, and best practices and use cases tailored to the requirements of the State Archives
- Creation of an Ingest test bed on a dedicated part of the FileNet repository to validate the completeness of recommended SIP protocols, procedures, and best practices
- Implementation of these protocols, procedures, and best practices in the digital preservation repository when it is operational

3.3.6 Institute Technology Watch Program to Mitigate Technology Obsolescence

Unlike paper records, electronic records have a high risk exposure to technology obsolescence that left unchecked will lead to the records becoming unreadable (therefore inaccessible) and unintelligible (not understandable to humans). Typically, this risk of exposure to technology obsolescence has been couched in term of hardware and software dependency.

Hardware dependency is another way of saying that electronic records can be read only by a specific storage device/media. The history of computer storage media is replete with examples of this.

- Paper tape cannot be read on magnetic tape drives
- Low density magnetic tapes cannot be read by very high density drives
- Round reel tapes cannot be read on tape cartridge drives, and there are have been many different types of tape cartridges over the years
- Longitudinal recording cannot be read by serpentine recording

Historically, device/media manufacturers supported this dependency because it promoted brand loyalty. In more recent years device/media manufacturers have promoted interoperability of storage devices and storage media that in the short run can mitigate device/media technology obsolescence. In the long run only periodic storage device/media can mitigate hardware obsolescence by keeping bit streams readable for as long as necessary.

Software dependency sometimes is understood to mean that electronic records can only be retrieved and rendered understandable to humans by having access to the original software that was used to create, use, and store electronic records. In most instances this is not a requirement because the key factor is a specific file format that contains instructions for how the 1s and 0s that the bit streams underlying electronic records will be encoded and the decoding occurs. Virtually every software developer has proprietary file formats that create intractable readability and understandability problems when formats become obsolescent (legacy) when the vendor no longer supports the format. The “fix” for format obsolescence involves the selection of sustainable interoperable open standard formats (e.g. PDF/A). These standard formats are likely to have two or more generations of backward compatibility, which greatly extends the window of opportunity file format transformation (migration). The Library of Congress has a program that identifies sustainable file formats that can enable operators of standards based digital preservation repositories to select file formats that are appropriate to specific environments.

Another approach to mitigating software dependency is through the use of emulation, which essentially involves keeping software functionalities alive through emulating them on technology independent platforms over time. Up to this point emulation has not reached a critical mass of commercial production that it is a viable tool to mitigate software obsolescence.

Tournesol Consulting recommends that the State of North Dakota mitigate the risk exposure of electronic records of historical value by:

- Periodic device/media renewal
- Adoption of sustainable interoperable open standard formats for electronic records of historical value in the custody of the digital preservation repository
- Monitoring the Library of Congress list of sustainable file formats and adopting new formats when appropriate.

4.0 Projecting Volumes of Electronic Records Destined for the State Archives

One of the objectives of the Digital Archives Study was to evaluate the growth rate of electronic records with permanent or historical value. The purpose of this analysis was to inform recommendations for the staffing and technology needed to support a digital preservation environment as well as considerations for mechanisms to transfer electronic records from agencies to the repository.

The limited scope and timeline for the study allowed Tournesol few opportunities to compile or have an opportunity to review a comprehensive list of digital information systems in use by North Dakota state agencies. Estimates of the current and projected volume of electronic records therefore are based on five different approaches:

1. How much storage capacity is there?
2. How much storage is being billed to state agencies?
3. How many electronic documents does FileNet manage?
4. How many electronic records have been received by the State Archives?
5. How many electronic records do other peer State Archives manage?

Method 1: Assess ITD Storage Capacity

Tournesol requested information about storage resources being managed by state agencies in an attempt to put upper bounds on the potential volume of electronic records as well as to assess the growth rate of storage. The strategy was to collect capacity information for the past two biennia (four years) to forecast growth for the two upcoming biennia. Because ITD approves purchases over $100K the assumption was that information about ITD and non-ITD storage assets would be available.

Tournesol was provided with a list of storage assets over a two year period (Table 5). At the outset of the period (March 2011) the installed capacity was 814.1 TB; by December 2013 the installed capacity had more than doubled to 1,716.0 TB. Actual usable capacity was about 50% of installed capacity because of disk formatting and mirroring, but usable capacity (Figure 6) also doubled over the two year period.

Table 5. Storage Capacity (March 2011 to December 2013)

Storage Type and Location	March-11 2011		December-13 2013	
	Usable Capacity (Terabytes)	Installed Capacity (Terabytes)	Usable Capacity (Terabytes)	Installed Capacity (Terabytes)
Disk Bismarck Totals	229.3	388.5	389.0	748.0
Disk Mandan Totals	129.8	285.6	435.3	818.0
Disk SHS Totals	10.0	12.0	10.0	12.0
Disk Totals	369.1	686.1	834.2	1578.0
VTS Bismarck Totals	unknown	unknown	48.0h	69.0
VTS Mandan Totals	unknown	unknown	48.0	69.0
VTS Totals	80.0	128.0	96.0	138.0
Storage Totals	449.1	814.1	930.2	1716.0

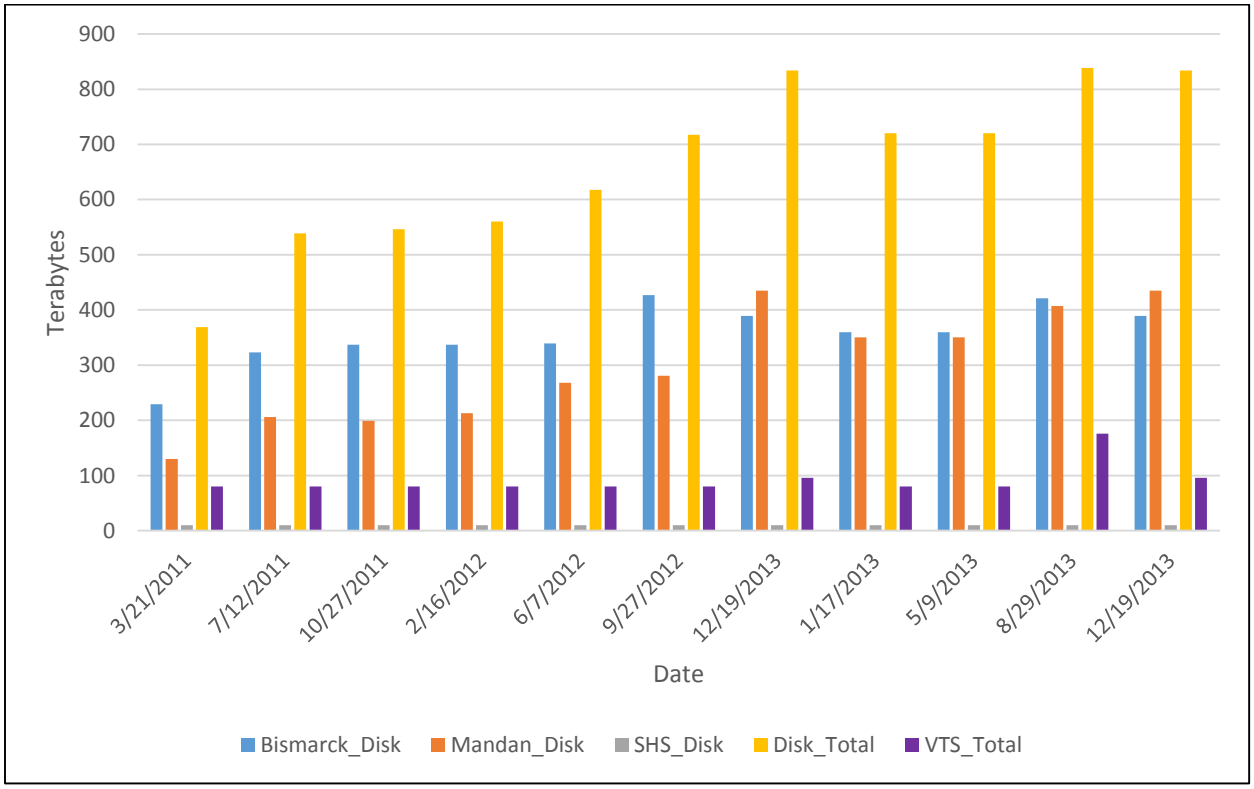

Figure 6. Usable Storage Capacity – March 2011 to December 2013

Method 2: Assess ITD Storage Billed to State Agencies

Analyzing state agency storage bills appeared to be a good strategy to refine the amount of actual data associated with state users. Billing rates were published and based on usage; Tournesol requested billing information for the past two biennia. The billing information provided showed actual storage use for physical and virtual servers but it was not detailed enough to apportion storage to agencies.

Four years of quarterly reports were provided to Tournesol (April 2010 through December 2013). Data was summarized by data center (Bismarck and Mandan), by physical server name, and by service level (Gold, Platinum, Silver, or Bronze). Tournesol aggregated data by service level and server which is shown in Figure 7 below. Billing data by agency were not available.

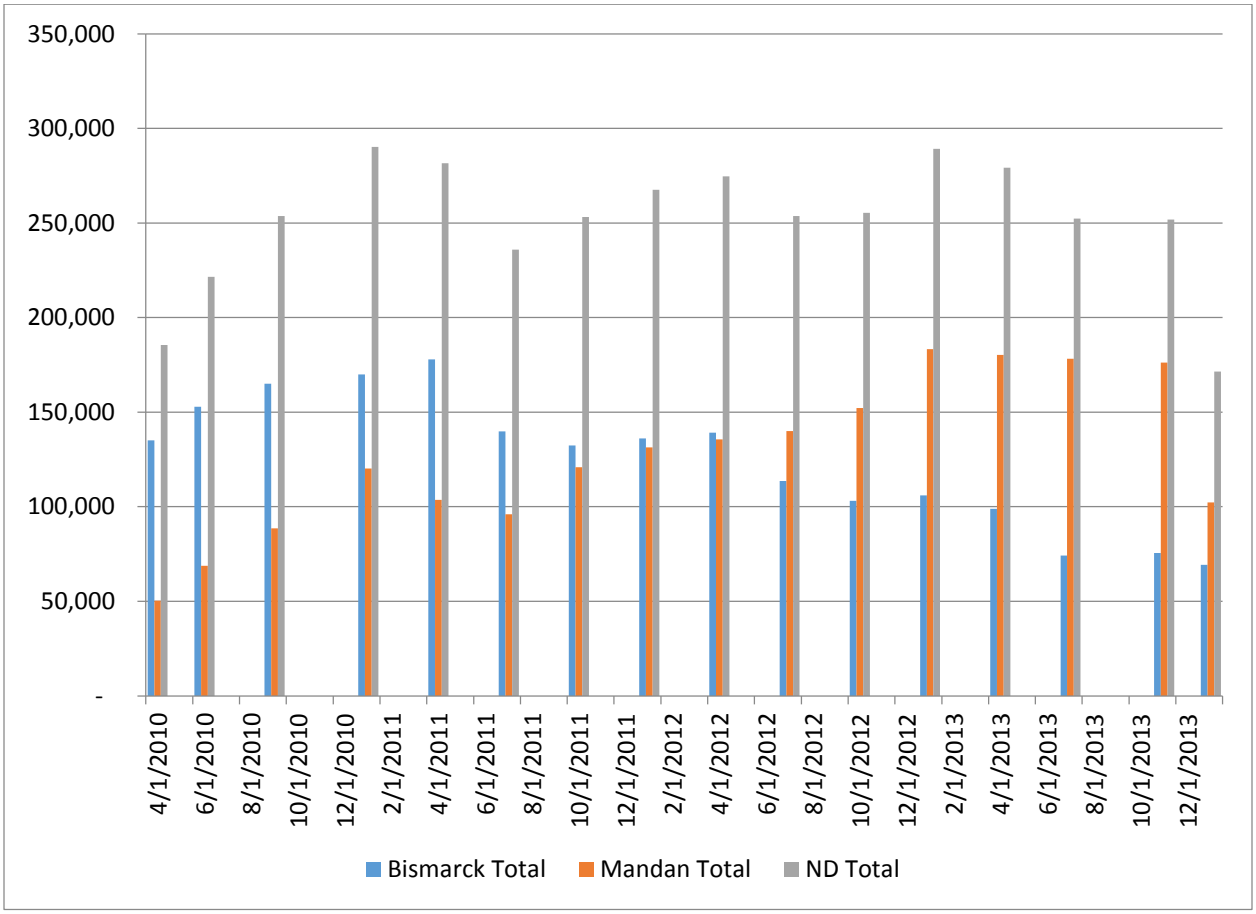

Figure 7. ITD Gigabytes Used - Physical Servers April 2010 to December 2013 (Source: ITD Billing Reports)

Tournesol observed two apparent trends in the billing data. First, December of even numbered years (2010 and 2012) seemed to represent peaks in billing. Second, it appears that workload is being moved from the Bismarck data center to the Mandan data center. Early in 2010 Bismarck billings were about double Mandan billings; by the end of 2011 Bismarck and Mandan were about equal, and by 2012 Mandan billing was significantly greater than Bismarck.

Increases in storage bills for physical servers was not growing despite the swift growth in storage capacity. Tournesol obtained virtual machine (VM) storage utilization statistics that confirmed that most of the growth in storage utilization comes from VMs. While storage capacity doubled, VM storage utilization quadrupled (Figure 8).

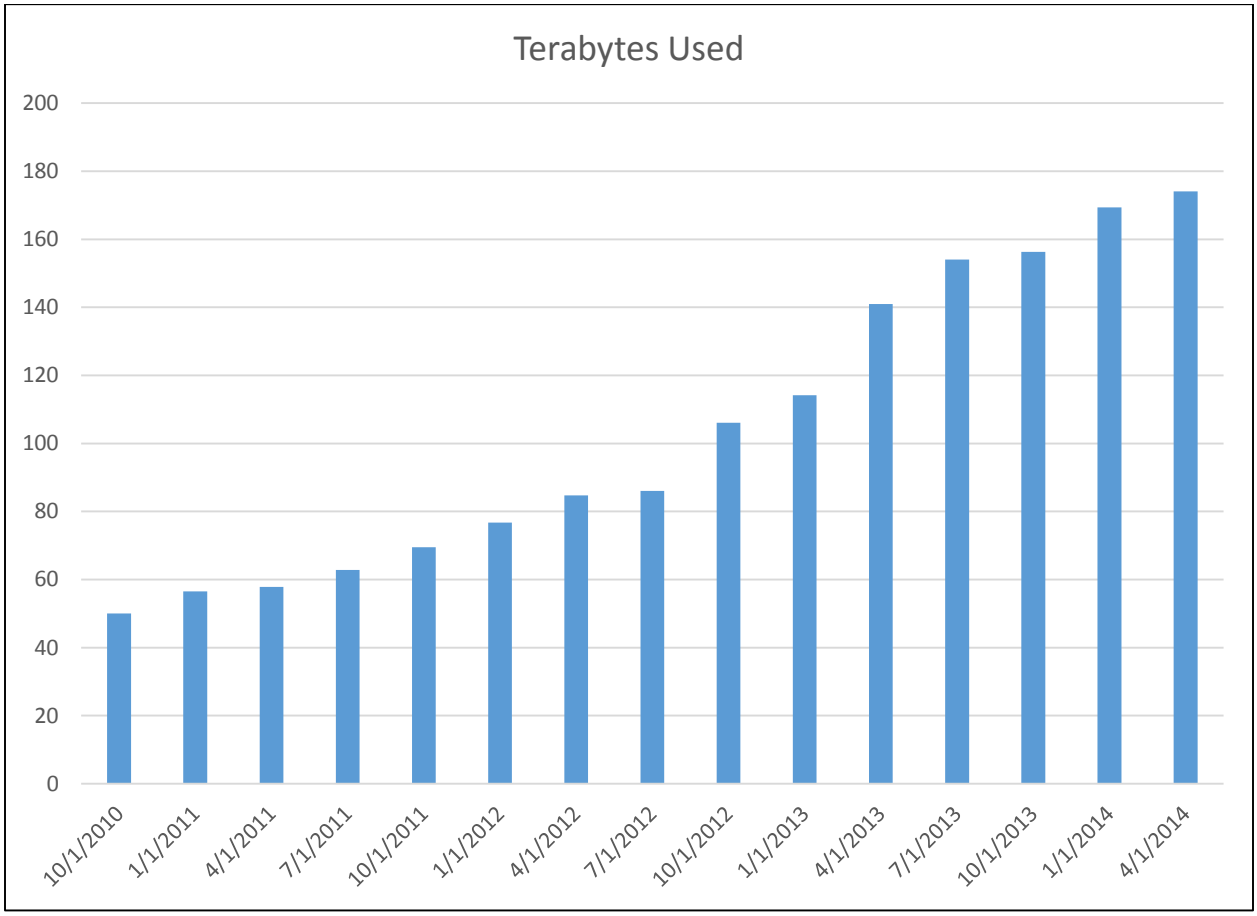

Figure 8. VM Storage Utilization - October 2010 to April 2014

Method 3: Assess FileNet Management of Electronic Documents

FileNet document and storage statistics for two dates (January 2013 and January 2014) were compared and reported in the Current State Assessment report. The information is shown here in Table 6. FileNet Documents by Agency (Year to Year Comparison). Tournesol received data summarized by agency however, it was not possible to distinguish between temporary and permanent records. Tournesol observed a growth rate of 17% in disk space utilization and an annual growth rate of 8.38% in documents.

Table 6. FileNet Documents by Agency (Year to Year Comparison)

Agency	January 27, 2013		January 27, 2014		Annual Size Change (%)	Annual Document Count Change (%)
	Size (GB)	Document Count (1000's)	Size (GB)	Document Count (1000's)		
Bank of ND	0.01	31.57	0.01	38	-10.97	16.78
Commerce	11.97	24.47	13.28	27.22	9.85	10.10
ConnectND	2.14	7.47	2.14	7.47	0.00	0.00
Corrections	182.52	713.10	214.54	875.61	14.93	18.56
DFI	110.45	29.50	155.65	34.11	29.04	13.50
DHS	1,329.08	7,879.40	2,042.84	9,073.61	34.94	13.16
DOH	5.97	101.91	5.97	101.91	0.00	0.00
DOT	1,429.69	16,826.03	1,611.28	17,528.05	11.27	4.01
ESPB	16.32	151.55	17.18	162.30	4.98	6.62
Highway Patrol	1.36	90.84	1.37	92.02	1.29	1.28
Insurance	23.43	109.27	30.24	125.54	22.51	12.96
ITD	24.02	580.88	24.38	655.28	1.47	11.35
JSND	302.40	5,548.45	337.85	6,198.17	10.49	10.48
OMB	16.41	78.47	18.03	85.92	8.97	8.67
PERS	221.65	1,350.40	227.67	1,482.73	2.64	8.93
RIO	11.09	211.71	12.19	226.73	9.00	6.62
SOS	98.49	705.83	120.37	761.39	18.17	7.30
State Land Dept	19.31	91.95	22.35	98.17	13.63	6.33
TAX	1,730.39	7,833.10	1,850.84	8,492.17	6.51	7.76
VET	1.77	9.96	45.91	123.25	96.14	91.92
WSI	1,756.42	18,363.11	2,040.17	20,109.64	13.91	8.69
Total	7,294.91	60,738.98	8,794.26	66,299.22	17.05	8.39

Method 4: Evaluate Electronic Records Received by the State Archives

The Digital Archive Study RFP indicated that the State Archives was unprepared to accept electronic records however, that has not prevented state agencies from delivering digital media to the Archives. Faced with the potential loss of digital assets, the Archives initially printed the content and accessioned that into its collection. As the volume of digital media increased printing became impractical and so for the most part the CD-ROMs, DVD-ROMs, tapes, and floppy disks have been left "as-is" and added to the physical collection.

Tournesol is concerned about the "one and only copy" of this digital media. CD-ROMs and other removable media are vulnerable to media deterioration and to being misplaced. Furthermore, the current transfer mechanism from state agencies to the Archives are paper-based assets; as a consequence, only scant information describes the contents of this digital media.

The issue is not insignificant. Tournesol calculated that 354 DVDs, 28 CDs, diskettes, video tapes, and even computer tapes have been sent to the State Archives. Table 7 shows a selected set of example media types and formats. There are at least eight different types of DVD media formats, several different types of CD-ROM and diskette media, and dozens of types of "computer tape" media.

Table 7. Examples of Digital Media Held in the State Archives

AGENCY	DIVISION	MEDIA FORMAT	DATA FORMAT	DESCRIPTION	RECORDS CONTROL NUMBER
Bank of North Dakota	Guaranteed Student Loan Division	Diskettes	Unknown	Division's Guarantor Procedures as of April 1, 2000.	31968 650712
Corrections and Rehabilitation	Central Office	CD	Unknown	Land Records for State Penitentiary & Industrial School, 1924-2004. Contains abstracts, warranty deeds, leases and receipts describing State Penitentiary land 1924-1971, correspondence 1942-1970, appraisal of Penitentiary land 1984 & 1988, State Penitentiary Land Board 1983-1985, Legal correspondence with the Attorney General 2000-2004, State Industrial School (Youth Correctional Center) Morton County Leases and Easements.	800322
Public Instruction	Career Education Guidance	Computer Tape reels, CD-R, Diskette		TESTING DATA from 1969-2007.	800318
Job Service	Administration	CD-R	Unknown	Cabinet Reports, Communications & USDOL Programs	050215
Public Service Commission	Public Utilities	Audio tapes, CDs, disks, and video tapes.	Unknown	Exhibits, 1990-2006. Consists of 39 ft. of formal & informal hearing exhibits which cannot be microfilmed.	800501

AGENCY	DIVISION	MEDIA FORMAT	DATA FORMAT	DESCRIPTION	RECORDS CONTROL NUMBER
Supreme Court		Diskettes	Unknown	Supreme Court, State. Case Files, 1889-1985. 282 ft. Contains Supreme Court Case Files which contain the docket sheets, briefs, computer diskette of briefs, appendices, transcripts, computer diskette of transcripts, other substantive pleadings and orders, the final order or opinion disposing of the case, and the judgment. In appeals relating to the Disciplinary Board, Judicial Conduct Commission, and Board of Law Examiners, the Supreme Court case file will also contain the record on appeal.	

A rough generalization of the total amount of data that could be contained on all these media is 2.5TB. The two terabyte estimate is based on DVD capacity at 4.7GB, CD capacity at 720MB, diskettes at 1.44MB, and computer tape reels with 200MB of capacity.

The process of accepting and processing electronic records is not a one-time event. Based on the most recent data, a single agency sent two dozen DVDs in one month. The February submission is shown in Table 8. Electronic Records Accessioned in February 2014 (Source: Email from Ann Jenks). The cumulative potential storage requirement for the February addition is less than 1GB, however, extrapolating this monthly activity of a single agency to project a “worse case” scenario of all agencies that have expressed interest in submitting electronic records over a period of one year results in an estimate of an additional terabyte per year.

While the amount of storage represented by the trickle of electronic records into the State Archives is negligible, the amount of work required to process (open, review, catalog, develop administrative, technical and descriptive metadata, virus check, and migrate electronic records) these state government records will become significant over time.

Table 8. Electronic Records Accessioned in February 2014 (Source: Email from Ann Jenks)

Record Control Number	Number of Files	Quantity (MB)	File Format
050244	44	302.0	pdf, tiff, xls
260501	227	152.0	pdf, xls, txt, wmv
450144	278	165.0	pdf, xls
050244	160	187.0	pdf, tiff
050244	3	32.5	pdf, xls
100128	7	24.9	pdf, xls
140139	4	24.8	pdf, xls
220110	22	28.1	pdf
220110	2	26.4	pdf, xls
450144	28	32.5	pdf, xls
550220	3	23.9	pdf, xls
650518	11	24.4	pdf, xls
650603	4	28.5	pdf, xls
700101	2	24.8	pdf, xls
800391	2	23.7	pdf, xls
850536	2	23.9	pdf, xls
850549	83	36.6	pdf, tiff
850549	2	23.7	pdf, xls
900101	2	23.8	pdf, xls
300101	2	24.5	pdf, xls

Method 5: Survey Selected State Archives for Current and Projected Volume

Tournesol conducted a survey of six selected State Archives to collect information about the current volume of electronic records in custody and the projected growth of electronic records by the end of 2016. All six state archives have established electronic records programs and actively solicit electronic records that can be stored in established preservation repositories. Table 9 below displays the survey results for the Kansas State Archives, the Kentucky State Archives, the Minnesota State Archives, the Mississippi State Archives, the North Carolina State Archives, and the Utah State Archives. Data for the North Dakota State Archives is reflected in the last column to the right.

The Minnesota State Archives and the North Carolina State Archives have the largest total volume of electronic records in 2014 and projected for 2016. More than one-third of the 70.5 TB in the custody of the Minnesota State Archives consists of digital images while slightly more than one-half of the 38.66 TBs in the custody of the North Carolina State Archives consist of scanned photographs.

Except for the Kansas State Archives (NA), the volume of electronic records in the remaining State Archives ranges from 0.565TB to 3.5TB. The projected growth rate varies greatly with the Kentucky State Archives and the Minnesota State Archives having the lowest projected growth rates. The projected growth rate for the North Carolina State Archives is about 75%, which actually reflects a significant volume increase from 38.66TB to 62.43TB. With the exception of the North Carolina State Archives none of the State Archives has a substantial volume of Web Records, Photos, GIS, and Audio Visual records. Perhaps the most striking observation is the relatively low volume of Text and Publication Records and Scanned images in the custody of the state archives. Given the acknowledged growth in creation of born digital records and scanned images by agencies, this suggests that what the State Archives have accessioned thus far is the "tip of a digital iceberg" and they will face a massive influx of electronic records over the next decade or so.

The North Dakota State Archives currently has about 2.5TB of electronic records in its custody even though it has no preservation repository and does not solicit the transfer of electronic records. The projected total volume of electronic records in its custody will almost double to 4.84TB by the end of 2016. This projected volume of permanent electronic records along with the stated interest of some state agencies to transfer electronic records of permanent value to the State Archives poses a major challenge that it is ill-prepared to address.

The decision of the North Dakota State Archives to take custody of more than 350 CD and DVDs and to continue that process is commendable but the CDs and DVDs in fact are exposed to a very high risk of loss of access, readability, understandability, and authenticity. This is symptomatic of the crisis that can only worsen over time in the absence of resources being made available to the State Archives to build the infrastructure of a Level Four preservation repository and implement that repository.

Table 9. Volume (Terabytes) of Electronic Records in Selected State Archives, 2014 - 2016

Categories	Kansas		Kentucky		Minnesota		Mississippi		North Carolina		Utah		North Dakota	
	2014	2016	2014	2016	2014	2016	2014	2016	2014	2016	2014	2016	2014	2016
Web Records and Databases	NA	NA	0.33	0.40	NA	NA	0.20	0.50	14.00	24.00	NA	1.00	NA	NA
Photos	NA	NA	0.33	0.38	NA	NA	NA	0.20	20.93	21.93	NA	NA	0.10	0.10
GIS Records	NA	NA	1.73	1.90	NA	NA	NA	1.00	1.23	12.00	NA	NA	NA	NA
Text, Publications	NA	NA	0.66	0.75	NA	NA	0.60	2.00	NA	NA	NA	1.00	NA	NA
Audio and Video	NA	NA	0.33	0.5	NA	NA	0.50	1.00	2.50	4.50	0.04	0.50	NA	NA
Email	NA	NA	NA	NA	NA	NA	0.30	10	NA	NA	0.02	0.47	NA	NA
Scanned Images	NA	NA	0.12	0.15	25.50	26.50	0.20	0.20	NA	NA	0.50	0.75	NA	NA
Other					45.00	46.00							2.44	4.94
Total	NA	1.00	3.50	4.08	70.50	72.50	1.28	5.90	38.66	62.43	0.57	3.72	2.54	4.94
Note: NA denotes that either the State Archives has no records in a category of records or that the holdings consist of fewer than 100 Gigabytes.														

5.0 Projected Volumes of Permanent Electronic Records with Historical Value

Determining an estimate of the number or storage requirements of electronic records with any amount of precision for the Digital Archives Study project has been challenging. As previously stated, the unprocessed digital media collected by the State Archives probably amounts to about 2.5TB with an unknown number of electronic records.

The general "rule-of-thumb" is about 5% of an organization's digital assets constitute information that is likely to be of historical archival value. Thus, a "worst-case" projection (Table 10) is 100TB based on usable storage, and the most "optimistic" or conservative projection is 8.5TB (7.5TB estimated to occupy digital media and one terabyte from FileNet). Experience at other State Archives tends to confirm the lower storage estimates.

Table 10. Estimated Electronic Records Volume Destined for the North Dakota State Archives

Assessment Method	Peak Storage Observed	Estimated Storage by the 2017-2018 Biennium	Estimated Storage with Archive Potential by the 2017-2018 Biennium (5%)
Usable Storage	814TB	2,000TB	100TB
Billed Physical Storage	300TB	300TB	15TB
Billed Virtual Machine Storage	174TB	610TB	30TB
FileNet Storage	9TB	15TB	0.5TB
Digital Media Shelved at the State Archives	2.5TB	7.5TB	7.5TB

6.0 Funding Analysis

The importance of preserving state government records with permanent historical value is promulgated in State statutes and was demonstrated in the obvious interest and concern of agency representatives interviewed for this Digital Archives Study. Issues necessarily arise with how to organize and fund activities as a consequence of this need to preserve information, especially in light of the exponential growth of electronic records.

While some archival requirements for digital information are similar to those for physical artifacts (e.g., appraisal and description), there are many more unique characteristics that require proactive approaches and sustainable management techniques to preserve and provide access to digital information for long as it is required. The commitment to ensure the integrity and availability of electronic government records must be on-going because of evolving legal and regulatory requirements as well as the inevitable obsolescence of technologies.

This section of the report looks at a variety of funding and financing options to support electronic records management and digital preservation initiatives. Tournesol recommends that the focus for the next two biennia should be on acquiring additional staff, providing training, and engaging expert consultants to accelerate development of the foundation for digital preservation capabilities.

Funding Categories

Funds to operate the State Archives are appropriated from general funds. As the digital preservation capabilities of the State Archives evolve to include born digital information generated by agencies and local government, a stable, recurring, source of funding will be necessary to manage its digital holdings into perpetuity. Special funds could be appropriated for maintaining these assets and with the advantage of being dedicated for that specific purpose; however, there may be better methods of funding a digital preservation repository.

How to Fund

In addition to funding categories there is the question of which agencies should seek funding to support digital preservation. Three types of organizations appear to be the most likely candidates:

- State Historical Society
- Information Technology Department
- All State agencies and local governments

The State Historical Society has a statutory responsibility and the lead role in appraising records for archival value, accessioning and preserving records, maintaining custody and providing access to records upon demand. These roles will continue for electronic records however additional expertise is required to establish and maintain the technical infrastructure and data management requirements for digital curation and preservation.

Day-to-day operation of a digital preservation repository that conforms to the specifications of an open archival information system (OAIS) is most appropriately delegated to technologists within ITD, agencies, or qualified third parties. Once the governance framework and key elements of a comprehensive electronic records management and digital preservation approach are in place, it will be necessary to add technical staff to manage the digital repository. This is similar to the program manager model used today by North Dakota for FileNet and the GIS Hub.

State agencies that do not use the centralized services of ITD and yet manage long-term and/or permanent operational records may wish to add digital preservation specialists in the not too distant future. Appendix B includes a position description for an Engineering Records Archivist that may be applicable in some agencies. State agencies and local governments produce electronic records and will continue to be consumers of archival records.

Potential Funding Sources

The start-up costs and on-going maintenance of a digital preservation repository managed by the State Archives are likely to be considerable. Given the current federal budget environment and the National Historical Publications and Records Commission (NHPRC) decision to reduce the number of electronic records management grants, it is unlikely that federal funds will be available to assist in establishment and operation of the digital preservation repository. Of necessity, therefore, state funding resources must be found.

A one-time special appropriations could jump start the digital preservation initiative but in the long run a more sustainable funding source must be identified. The Legislature could fund ITD recommended digital preservation services on an agency by agency basis in each biennium and bill agencies for these services along the same lines as it currently bills chargebacks.

A funding alternative is to link State Archives digital preservation services to local governments that are required to transfer records to the State Archives. Adding a transaction fee to each legal instrument filed in county courts, for example, could fund a distributed electronic records management program and a consolidated State Archives digital preservation repository.

ITD already has the authority to review and provide recommendations to executive branch state agency information technology projects with an estimated cost of $100,000 or more. Tournesol recommends that ITD explore the possibility of establishing a mandatory “set aside” for systems that will create, manage and preserve state government records of long-term operational and/or permanent archival value. This would not only help to raise awareness and educate state agencies about digital continuity issues and costs, but also potentially positively impact design and implementation considerations.

Agency Funding

While it would be most convenient to assign the entire digital preservation budget funding issue to ITD, most State records are generated by other agencies. Assigning funding for preservation activities to agencies comes with a measure of risk. The meaning of the term "archive" is widely misinterpreted; therefore, appropriating funds to agencies to pay for the cost of their historical information assets is likely to fail without a substantial amount of preparation. It would not be unreasonable to set aside an entire biennium to educate and encourage reviews of processes and procedures to establish a basic set of preservation values within agencies. Furthermore, the lessons learned from the successful collaboration on the GIS Hub and other statewide alliances may be an opportunity to exploit and demonstrate the value of archival information assets.

It may be appropriate to eventually fund preservation activities through an augmented fee on the costs of providing access to data and records for users (e.g., by a "levy") on records that must be retained for twenty years or longer regardless of their location (i.e., centralized storage by ITD or storage within an agency).

Fee-Based Funding

An alternative "public-funded" mechanism might be possible. Other states have successfully supported records access in this manner. Some of the information assets administered by agencies (e.g. oil and gas) are being exploited by business to create economic value and activity. A subscription model for access to non-confidential state information resources might defray some of the expense of a trustworthy digital preservation repository.

Regardless of whether it is a subscription or "fee-for-service" this type of funding represents a return to what used to be the customary way of delivering revenue-producing information to the public. A study to determine the actual cost of responding to these types of public inquiries for revenue-producing information would be useful regardless of whether an actual fee is collected.

Public-Private Partnership

Public-private partnerships represent another funding opportunity for the state's digital preservation initiative. Tournesol is aware of other states that have engaged a wide range of stakeholders in various aspects of raising funds to support their digital preservation activities and digital collections.

Tournesol believes that the opportunity exists to support this historic initiative to enhance North Dakota's heritage and to simultaneously raise awareness about the criticality and usefulness of long-term and permanent state government records. We recommend that ITD and the State Historical Society work together to develop proposals for the digital preservation program to receive support from a variety of potential sources including the Outdoor Heritage Fund, and oil and gas resources. Engagement with other public-private groups could help advance the goals of life cycle management of state government records and the preservation of digital records that have permanent historical value.

7.0 Funding Recommendations

As detailed throughout this report, **Tournesol strongly recommends that the State of North Dakota invest its resources for the next two biennia in the development of foundational components of a state-wide electronic records management and digital preservation program.** Recommendations and estimated costs for planning purposes presented in this section fit into four categories: Staffing; Consulting; Software; and Storage.

While there is no single governance structure or approach that will work for all states, North Dakota has the advantage of being able to follow a number of best practice approaches that are in current use. It is critical that a significant effort to raise awareness, boost inter-agency planning and coordination, and find ways to integrate electronic records and digital preservation considerations into the life cycle of enterprise systems be undertaken.

STAFFING: Digital Preservation Expertise for the State Historical Society

Although the role of the State Historical Society to appraise and accession electronic records and sustain a digital preservation repository is a relatively modest portion of the total cost of a digital preservation program for the State of North Dakota, it will require one or more digital preservation specialists. This should be the top funding priority in the 2015–2017 biennium because without the available of specialized expertise available to advise agencies as well as ITD and SHS staff, a digital preservation strategy and policy framework (both precursors to the digital repository repository) are unlikely to succeed. Appendix B contains a sampling of position descriptions.

STAFFING: Electronic Records Analyst for ITD

The current work of the Records Management staff needs to be supplemented by an experienced and knowledgeable resources who can specifically address the unique requirements of electronic records. Adding a dedicated resource to help roll out the revised retention scheduling process and forms should be a top funding priority in the 2015-2017 biennium because without a dedicated resource, the state will fall further behind in mapping its retention and disposition rules to the digital information systems where state agencies are creating, managing and storing electronic records. Appendix B contains a sampling of position descriptions.

CONSULTING: Electronic Records Management and Digital Preservation Training

An additional ITD preservation-related funding priority for the 2015-17 biennium is training. State Records Management needs new records management procedures and tools, and to inventory and re-evaluate agency records to identify electronic records systems. Without continuing education to keep skills up-to-date the task quickly becomes difficult as applications are upgraded and replaced with new technologies.

State Records Management should refine scheduling and disposition processes for electronic records and be available to provide support and training to agency records and IT coordinators. In combination with training, ITD should consider adding new preservation-based skill sets to its repertoire of services (e.g., how to transform TIFF files to JPEG200 format or denormalize database information for long term retention).

An estimate of $2,500 per employee is a starting point for a first round of training. Tournesol recommends that North Dakota identify a core set (10-15 staff) from ITD, SHS, and select agencies to include in the first cohort. While training is available through several associations, we believe North Dakota should consider bringing in external trainers who can combine general electronic records management and digital preservation education with some content customized to North Dakota's environment and priorities. Recording the instruction would enable ITD and SHS to stretch training dollars by setting up additional sessions for stakeholders using a combination of internal and external resources.

CONSULTING: Engage Preservation Expertise to Accelerate Progress

Tournesol recommends engaging with expert consultants on an on-going basis over the next two biennia to assist with the development of preservation strategies, policies, and to help guide the proposed Digital Preservation Working Group. Assistance will be of greatest need early in the program, lessening as expertise is developed in house. Tournesol believes engagement with highly skilled preservation experts can accelerate by years the startup of the preservation program for the State Historical Society and ITD.

SOFTWARE AND CONSULTING: Configure and Implement Email Archive

A recommended funding priority is the acquisition and deployment of an automated email archive. There are numerous advantages to an email archive operated by ITD including mitigating the potential loss of Governor and Agency leadership correspondence. The Current State Assessment identified a considerable amount of time spent by employees handling emails for retention; including executive correspondence, and manual searches of local PST files for emails saved by employees. The lost productivity of employees in other organizations spent searching for saved emails in a variety of locations, formats, and systems has been shown to be hugely expensive. The practice of printing emails to paper can raise issues of authenticity and integrity unless great care is taken to ensure sufficient metadata is systematically captured. Printing email to paper and then scanning the paper to a digital image copy also has its limitations. The State needs an email archive for the ~~minority of~~ messages that must be retained as records. ITD is the obvious choice to operate that system.

STORAGE: Electronic Records of Archival Value

A recommended funding priority is the purchase of additional ITD gold storage by the State Historical Society to accommodate the transfer of electronic records from state agencies on short-term media to network storage. As the electronic records management and digital preservation programs come online steady growth in archival storage requirements should be anticipated.

Cost Summary

This chart provides a summary of the costs associated with Tournesol's recommendations[9] for the State of North Dakota to address its requirements for long-term digital preservation. Salary estimates were obtained from the Federal Government Job Database (USAJOBS.GOV). Pricing for the IBM Content Collector for Email was obtained by Robert Rogers from Sirius Computer based on 2730 RVUs which equates to 5627 active mail boxes.

[9] Recommendations cover a period of approximately five years or the span of two biennia.

Table 11. Cost Summary of Digital Archives Study Recommendations

Category	Description	Unit Cost	Extended Cost	Recommended Funding Source
Staffing	Digital Archivist	$126K/year	$262K/ biennium	SHS
Staffing	Digital Archive Intern	$20/hour	$20K/ biennium	SHS
Staffing	Electronic Records Analyst	$72K/year	$144K/ biennium	ITD
Consulting	Digital Preservation Policy and Strategy	$180/hour	$50K-100K (onetime)	ITD Onetime
Consulting	Email Archive Installation & Customization Consultant	$180/hour	$120K (onetime)	ITD Onetime
Consulting	SIP and Transfer Process Design	$180/hour	$30K-50K (onetime)	SHS Onetime
Consulting	Electronic Records - redesign record series mapping to digital information systems, and train agency personnel on how to assign records retention periods to electronic records at or near the time of their creation and receipt	$180/hour	$75K-100K (onetime)	ITD Onetime
Consulting	Standards Development and Updates	$180/hour	$40K-60K (onetime)	ITD Onetime
Consulting	Statutes Updates	$180/hour	$30K (onetime)	ITD Onetime
Consulting	Digital Preservation Training Workshop for agency personnel	$180/hour	$30K (onetime)	SHS Onetime
Software	IBM Content Collector for Email	$260K/year	$520K/ biennium	ITD
Storage	Migrated Monthly Transfers to SHS	$4,975/TB (onetime) $400/TB (monthly maintenance) $158/TB (monthly backup)	$40K (onetime) $160K (maintenance and backup)	SHS

Notes:

1. The Digital Preservation Working Group is projected to use about 5% each for these key stakeholder roles: Enterprise Architect, State Archivist, Electronic Records Analyst, EDMS Administrator, Storage Administrator, Digital Archivist, Security Administrator, Business Continuance Architect
2. Email Archive Support is projected to use about 10% each for these key stakeholders: Exchange Administrator, Electronic Records Analyst, EDMS Administrator, and 5% each for: Storage Administrator, Digital Archivist, Security Administrator
3. Salary estimates were obtained from the Federal Government Job Database (USAJOBS.GOV) and calculated with an additional 26% for benefits based on advice from the North Dakota project team.
4. IBM Content Collector for Email pricing obtained from Sirius Computer based on 2730 RVUs which equates to 5627 active mail boxes.
5. Migrated Monthly Transfer storage costs are calculated through the 2017-2018 biennium.

Appendix A: Digital Repository Platforms

The following list of digital repository solutions and services are provided for informational purposes only. No endorsement of any of these technologies or solutions is implied by inclusion in this list.

Archivematica: http://archivematica.org

Archivematica is a comprehensive digital preservation system that uses a micro-services design pattern to provide an integrated suite of free and open-source tools that allows users to process digital objects from ingest to access in compliance with the ISO-OAIS functional model.

APPX Archives Enterprise Manager (AXAEM): http://www.axaem.com/

AXAEM is a content management system designed specifically for state and other archives responsible for managing records and collections. AXAEM is available from APPX Software, Inc. under an Open Source license.

Note: AXAEM implementation documentation is available from the Utah State Archives at:

http://archives.utah.gov/axaem/axaem.html

Carolina Digital Repository's Curator's Workbench:

http://www.lib.unc.edu/blogs/cdr/index.php/2010/12/01/announcing-the-curators-workbench/

A desktop tool to manage the submission workflow and processing for large collections with custom metadata. The process produces a METS manifest, and the digital repository technology base is Fedora and iRODS Grid. Curator's Workbench is free and open source software hosted at www.github.com

CONTENTdm Digital Collection Management Software by OCLC: http://www.contentdm.com/

CONTENTdm handles storage, management and delivery of library digital collections.

DSpace: http://www.dspace.org/introducing

DSpace is an Open Archives Initiative (OAI)-compliant open-source software released by MIT for archiving e-prints and other kinds of academic content. DSpace preserves and enables access to all types of digital content including text, images, moving images, mpegs and data sets.

DuraCloud: http://www.duracloud.org

DuraCloud is a cloud-based preservation and storage provider.

ESRI Geoportal Toolkit: http://www.esri.com/software/arcgis/geoportal/index.html

ESRI Geoportal Server is a free open source product that enables discovery and use of geospatial resources including datasets, raster, and Web services. The Geoportal Server supports standards-based clearinghouse and metadata discovery applications.

Fedora Repository Project: http://www.fedora-commons.org

Fedora (Flexible Extensible Digital Object Repository Architecture) was originally developed by researchers at Cornell University as an architecture for storing, managing, and accessing digital content in the form of *digital objects* inspired by the Kahn and Wilensky framework. Fedora defines a set of abstractions for expressing digital objects, asserting relationships among digital objects, and linking "behaviors" (i.e. services) to digital objects. The *Fedora Repository Project* (i.e., Fedora) implements the Fedora abstractions in an open source software system.

iRODS (Integrated Rule-Oriented Data System): http://www.irods.org

iRODS, the Integrated Rule-Oriented Data System, is a data grid software system developed by the Data Intensive Cyber Environments research group and collaborators. iRODS management policies (sets of assertions communities make about their digital collections) are characterized in iRODS Rules and state information. At the iRODS core, a Rule Engine interprets the Rules to decide how the system is to respond to various requests and conditions. iRODS is open source under a BSD license.

Preservica: http://www.preservica.com

Preservica is a cloud-based preservation platform using Tessella's Safety Deposit Box (SDB). Preservica provides an ingest platform and preservation services that conform to the OAIS reference model.

Tessella: http://www.tessella.com/solutions-technologies/solutions/archiving-digital-preservation/

Tessella Safety Deposit Box (SDB) provides a platform and services that conform to the OAIS reference model. SDB provides support for Ingest, Preservation, Access, Data Management and Administration, and Storage.

Appendix B: Sample Position Descriptions

Job Title: **Information Management Officer (Digital Continuity**), P4
Department/ Office: Department of Management
Duty Station: NEW YORK
Posting Period: 10 February 2014-11 April 2014
Job Opening number: 14-IMA-DM-32363-R-NEW YORK

This position is located in Department of Management (DM), Office of Central Support Services (OCSS), Archives and Records Management Section. The Information Management Officer will report to the Chief of Section.

Responsibilities
Under the direct supervision of the Chief of Section, the Information Management Officer will be responsible for the following duties:

- Contributes to the formulation of policies, procedures, standards and guidelines necessary for long-term
- management and preservation of the Secretariat's digital records and archives in institutional repositories;
- Develops and leads the implementation of a digital repository in the Section with associated preservation services, processes and standards.
- Represents the Section, as required, to provide expertise in digital continuity at working groups, task forces and other fora, advocating recordkeeping and/or archives perspectives and standards; manages relationship and liaison with stakeholder business and technology units.
- Conducts research on relevant information technology to implement digital continuity capability in the
- Section and stakeholder units.
- Evaluates and monitors work programme in the context of the results-based framework; prepares data and recommendations for decision-making and reporting.
- Carries out managerial responsibilities at the unit level relating to compliance with administrative requirements, programme planning, policy and procedure recommendations, budgeting, human resources and facilities management.
- Performs other duties as assigned.

Competencies

PROFESSIONALISM: Knowledge of information management, archives management and recordkeeping. Knowledge of digital continuity and preservation principles, standards and practices. Knowledge of technologies and processes for trustworthy digital repository management. Ability to demonstrate conceptual, analytical and evaluative skills, identifying and assessing issues, formulating options and making conclusions and recommendations. Shows pride in work and in achievements; demonstrates professional competence and mastery of subject matter; is conscientious and efficient in meeting commitments, observing deadlines and achieving results; is motivated by professional rather than personal concerns; shows persistence when faced with difficult problems or challenges; remains calm in stressful situations. Takes responsibility for incorporating gender perspectives and ensuring the equal participation of women and men in all areas of work.

PLANNING AND ORGANIZING: Develops clear goals that are consistent with agreed strategies; identifies priority activities and assignments; adjusts priorities as required; allocates appropriate amount of time and resources for completing work; foresees risks and allows for contingencies when planning; monitors and adjusts plans and actions as necessary; uses time efficiently.

TECHNOLOGICAL AWARENESS: Keeps abreast of available technology; understands applicability and limitation of technology to the work of the office; actively seeks to apply technology to appropriate tasks; shows willingness to learn new technology.

Education
Advanced university degree (Master's degree or equivalent) in archival, information science, information systems, social science or related field. A first-level university degree in combination with two additional years of qualifying experience may be accepted in lieu of the advanced university degree.

Work Experience
A minimum of seven years of progressively responsible experience in modern archives management, record keeping, library, information management or related area is required. Hands-on experience in digital preservation, continuity and repository management; experience in the application of principles and techniques using current tools, methodologies and standards is required.

Languages
English and French are the working languages of the United Nations. For this post, fluency in English is required. Knowledge of a second UN official language is an advantage.

Digital Preservation Officer
National Library of Scotland - Edinburgh

To maintain and develop systems and processes to ensure that the library's digital information and objects remain accessible, re-usable and understandable in the future, and that the authenticity, integrity and reliability of digital content is retained, with minimum loss over time; To provide knowledge, advice, and training in the library's digital preservation functions; To support the Digital Assets Manager ensuring standards and procedures are consistently applied; To contribute to the development of policies and procedures for the Digital Assets Team; To work within the corporate framework and in collaboration with other colleagues to help deliver organisational goals.

Duties and Responsibilities

- Developing and maintaining systems and processes to ensure the preservation and accessibility of the library's digital information and objects, including text, images, audio, video, datasets and websites;
- Implementing continuous review and improvement of digital preservation processes, including regular review of repository and preservation standards and best practices; Contributing to the development of the library's digital preservation policies;
- Researching, designing, developing, testing and implementing preservation actions for NLS digital information and objects;
- Surveying the digital preservation environment and emerging technologies, with regard to NLS digital objects;
- Conducting life-cycle cost analysis to forecast and advise on future system, storage, and funding requirements;
- Conducting analysis to determine the best actions for any preservation instance;
- Identifying, evaluating, and specifying hardware and software requirements for digital preservation in consultation with NLS colleagues, the digital preservation community, and vendors;
- Monitoring, analysing, and reporting on, risk to NLS digital information and objects, including analysis and maintenance of checksum routines, format verification and authentication, and preservation planning;
- Working collaboratively with colleagues across the Library, particularly curators of digital assets and owners of digital processes, to deliver digital preservation solutions and systems and to embed digital preservation into library systems and processes;
- Liaising with other organisations on matters of digital preservation;
- Contributing to the design of workflows for digitisation, digital acquisition, digital deposit, and web harvesting;
- Training, instructing and supervising staff and students in tasks associated with the job function;
- Answering enquiries and providing advice related to the job;
- Preparing appropriate reports, including performance monitoring, to the Digital Assets Manager, as required;
- Deputising for the Digital Assets Manager, as required;
- Meeting regularly with the Digital Assets Manager to review personal performance and discuss issues of mutual interest or concern;
- Attending staff meetings, and taking minutes, as required; Participating in projects, working groups, internal and external forums as appropriate and in accordance with agreed work plans;
- Participating in staff training and development; Contributing to the continuous improvement of procedures, service standards and documentation;
- Contributing to the development of team and departmental plans and strategies.

Core Competencies

- Delivering Results (Core) – Take personal responsibility for achieving the right results for the Library
- Customer Focus (Core) – Understand and, within our capability, meet actual and potential internal and external customers' needs.
- Collaborative Working (Core) – Working together effectively to achieve common goals through sharing skills, knowledge and information. Collaborating with others to improve services and reduce costs.

Skills, Abilities and Knowledge

Essential

- Problem-solving – ability to identify problems and evaluate selected methods to resolve them;
- Reasoning – ability to identify and analyse rules, principles, or relationships and to make logical inferences or conclusions;
- Literacy - ability to understand, interpret and present verbal and written information;
- Numeracy – ability to understand, interpret and present numerical information;
- Teamwork and collaboration - ability to work with others to achieve shared goals and recognise the value of diverse perspectives;
- Hardware - ability to use computers, peripherals, mobile devices, and standard office equipment;
- Software - ability to use software, social media, or mobile applications;
- Applied learning - knowledge and skill to apply formal training, education, or experience to accomplishing work;
- Professional knowledge – knowledge and application of the corpus of knowledge of digital preservation, digital publishing, and digitisation;
- Supervision – ability to train, motivate and encourage others;
- Customer focus – understand and, within our capability, meet actual and potential internal and external customers' needs.

Desirable

- Professional knowledge – knowledge and application of the OAIS reference model.

Personal Qualities

Essential

- Attention to detail - ability to be thorough and accurate when performing work;
- Flexibility - ability to change and adapt behaviour or work methods in response to new information, changing conditions, or unexpected obstacles;
- Interpersonal skills - ability to show respect, concern, and empathy for others.
- Self-management – ability to set well-defined and realistic work objectives, display initiative, and demonstrate responsible behaviour;
- Negotiating – ability to persuade others to accept recommendations, cooperate, or change their own or others' behaviours to reach mutually acceptable solutions;
- Delivering results – take personal responsibility for achieving the right results for the library.

Experience

Essential

- Digital Preservation – experience of digital preservation technology and practice.

Desirable

- Professional standards - experience of working with specific metadata standards, including Dublin Core, EAD, METS, MIX, MODS, PREMIS.

Digital Archivist
University of Texas at San Antonio

Location: San Antonio, Texas
Type: Full Time - Entry Level
Categories: Electronic Records, Special Collections
Required Education: Masters

University of Texas at San Antonio

The University of Texas at San Antonio Libraries is seeking forward-thinking, dynamic applicants for the position of Digital Archivist. Reporting to the Head of Special Collections, this position ensures the long-term preservation of born-digital materials, facilitates the digitization of Library materials, and provides access to digital holdings.
In strong collaboration with Library Systems, the University Archivist, and Manuscripts Curator, the Digital Archivist will develop processes, procedures, and specifications for collecting, preserving, and providing access to born-digital records and hybrid collections; investigate, plan, and manage format conversions and migrations; plan, coordinate, and implement workflows for digital content creation, including quality control procedures, prioritization of production to develop high levels of productivity; provide training in processes and specifications for digital collection creation; coordinate and supervise special projects; and collaborate with the Web developer and other staff for online exhibits and other discovery tools, including social media services.

Minimum qualifications for the position include a Master's degree in Library or Information Sciences or a Master's degree in Archival Science or equivalent advanced degree. Successful candidates are expected to have knowledge of appropriate digital library technologies and related best practices for digital object creation, at least one year of experience in digital preservation or information management, digitizing and working with digital content, and implementing and maintaining digital content management systems. Candidates are also expected to have progressively responsible experience with the concepts and software/hardware applications used in managing and presenting digital information.

Preferred qualifications include a demonstrated knowledge of the creation and use of digital objects, experience in curating digital content in an archival repository, large-scale digitization in an academic environment, experience with metadata extraction, transformation, and repurposing, and the ability to plan, coordinate and implement effective programs, complex projects and services.

Electronic Records Archivist
South Carolina Department of Archives and History
Type: Full Time - Entry Level
Categories: Archives Management, Electronic Records, Government Archives
Preferred Education: Masters
South Carolina Department of Archives and History

Description

Under general supervision, works as part of a project team to administer policies and help state agencies and local governments develop procedures and practices for managing their electronic records and systems. Serves as an electronic records archivist with primary responsibility for identifying, preserving, and providing access to archival electronic records. Plans, develops, and implements electronic records management processes, guidelines, and procedures in state agencies and local governments and tests approaches to address long-term preservation and access issues. Plans, develops, and implements procedures for preserving and providing access to the archival electronic records acquired by the department and those remaining in the custody or agencies. Conducts projects to identify, appraise, and develop retention schedules for state agency and local government electronic records, and other duties as assigned.

Minimum Requirements

Knowledge of general archival and records management concepts; general knowledge of electronic records issues; Basic knowledge of hardware and software used for electronic document management systems, digital imaging systems, and desktop applications; knowledge of database management , systems analysis, and systems development concepts; some familiarity with metadata and related standards for information processes and their application to archival or record materials; and knowledge of data storage methods, media, and security. This position is critical to the success of the electronic records program and its related goals of providing for the long-term preservation and access issues. Plans, develops, and implements procedures for preserving and providing access to the archival electronic records acquired by the department and those remaining in the custody of agencies. Conducts projects to identify, appraise, and develop retention schedules for state agency and local government electronic records, and other duties as assigned.

Preferred Qualifications

A Graduate Degree In Library and Information Science or Public History and/or Graduate Training in Archives Administration, Records and Information Management.

Engineering Records Archivist
Fairfax Water

Location:
Fairfax, Virginia
Type:
Full Time - Experienced
Categories:
Archives Management, Corporate Archives, Electronic Records
Preferred Education:
4 Year Degree

Fairfax Water

Under general supervision of the Manager, Engineering, responsible for development and implementation of an engineering records and archives system for the Planning and Engineering Division of Fairfax Water. Serves as Fairfax Water's expert for engineering records and archive material retention standards and procedures. Responsible for material acquisition, evaluation, cataloging, maintenance, management and control of engineering records, and performs other department related activities.

- Development and implementation of records retention plans for Fairfax Water's Planning & Engineering documents, including site plans, as-built drawings, specifications, shop drawings, operations & maintenance manuals, project files, and other documents.
- Performs file creation, maintenance and organization of documents and related work by: Applying knowledge of utility design and personal insight to determine record validity and accuracy. Applying judgment for retaining appropriate documents and discarding information not required for permanent files within guidelines established by Fairfax Water and the Commonwealth of Virginia. Scanning and electronically filing documents received from Planning and Engineering Departments. Tracks archival progress of incoming materials from receipt through scanning, digitizing, verification and validation filing.
- Establishes procedures for the permanent retention of critical Fairfax Water records to include the selection of appropriate storage medium, handling, retrieval techniques, and document preservation requirements.
- Identifies standards in common archiving practice and makes recommendations to improve the engineering archives.
- Provides formal and informal training with Fairfax Water staff regarding how to prepare documents for the archives and now to access these documents.
- Reviews as-built drawings as prepared by others for retention, and inclusion in archives.
- Performs research and data extraction from existing records and completed construction plans for staff, local government, engineering consultants, and contractors.
- Maintains the Planning & Engineering technical library.
- Maintains project photograph documentation and incorporates into the archives.
- Performs other department-related activities by preparing visual aids, charts and graphics based on archive materials for presentation, using personal computer, printers, and reproduction equipment.
- Prepares budgets to meet the needs of the archiving process
- Performs other duties as assigned or required.

QUALIFICATIONS
Graduation from a four-year college or university with a Bachelor's Degree in Library Science or related field and a minimum of six years progressively responsible professional experience in records appraisal, cataloging and management, or any equivalent combination of education, experience, and knowledge. Archival education and training a plus.

- Thorough knowledge of engineering records management.
- Thorough knowledge of designing and developing automated record creation and record keeping systems.
- Knowledge of archival information systems, metadata including, inventories, finding aids and specialized indexes.
- Ability to read and interpret engineering drawings and related documents.
- Must be highly organized, accurate and detail oriented.
- Proficient knowledge of Windows environment, MS Word, MS Excel, MS Access applications. Knowledge of MS Sharepoint preferred.
- Ability to operate standard duplication and preservation machines of the trade.
- Ability to follow oral and written instructions.
- Ability to communicate effectively both orally and in writing.
- Ability to establish and maintain effective working relationships with co-workers, supervisors and the general public.
- Ability to work independently with a minimum amount of supervision and adapt to changing priorities.
- Ability to lift 30 pounds.

DA 281-2 State of Kansas - Department of Administration
Rev. 4-13 **OFFICE OF PERSONNEL SERVICES**

Position Description

Read each heading carefully before proceeding. Make statements simple, brief, and complete. Be certain the form is signed. Send the original to the Office of Personnel Services.
CHECK ONE: ☐ NEW POSITION ■ | EXISTING POSITION

Agency Number

Part 1 - Items 1 through 12 to be completed by department head or personnel office.

1. Agency Name Kansas State Historical Society	9. Position No. K0048377	10. Budget Program Number 01351	
2. Employee Name (leave blank if position vacant)		11. Present Class Title (if existing position) Policy & Program Analyst	
3. Division State Archives		12. Proposed Class Title	
4. Section State Archives & Records Management	For	13. Allocation	
5. Unit	Use	14. Effective Date	Position Number
6. Location (address where employee works) City: Topeka County: Shawnee	By	15. By / Approved	
7. (circle appropriate time) Full time xxxx Perm. xxx Inter. Part time Temp.	Personnel	16. Audit Date: By: Date: By:	
8. Regular hours of work: (circle appropriate time) FROM: 8:00 a.m. – 5:00 p.m. Monday thru Friday, occasional Saturday	Office	17. Audit Date: By: Date: By:	

PART II - To be completed by department head, personnel office or supervisor of the position.

18. If this is a request to reallocate a position, briefly describe the reorganization, reassignment of work, new function added by law or other factors which changed the duties and responsibilities of the position:

19. Who is the supervisor of this position? (person who assigns work, gives directions, answers questions and is directly in charge)?

Name	Title	Position Number
Matthew B. Veatch	State Archivist	K0050583

Who evaluates the work of an incumbent in this position?

Name	Title	Position Number
Matthew B. Veatch	State Archivist	K0050583

20. a) How much latitude is allowed employee in completing the work? b) What kinds of instructions, methods and guidelines are given to the employee in this position to help do the work? c) State how and in what detail assignments are made.

This position plans and carries out assignments with little or no supervision. Assignments are broad in scope and require a multidimensional knowledge of Kansas government agencies, in depth knowledge of records retention and disposition schedules, and familiarity with the diversity of information technology applications in Kansas government. The employee reports to the State Archivist by means of occasional discussions and written communications to discuss work progress or new problems. In most cases the employee will be provided with expected outcomes and will be given significant autonomy to determine and implement appropriate methods for achieving them. Many of the tasks will be related to collaborating with state agencies on the ingest of electronic records into the Kansas Enterprise Electronic Preservation (KEEP) system, a trusted digital repository that serves as the electronic State Archives. Since this is a new endeavor, regular interaction between the employee and the State Archivist will be required to insure a consistent approach in dealing with state agencies.

18. Describe the work of this position using the page or one additional page only. (Use the following format for describing job duties):

What is the action being done (use an action verb); to **whom** or **what** is the action directed (object of action); **why** is the action being done (be brief); **how** is the action being done (be brief). For each task state: Who reviews it? How often? What is it reviewed for?

Number Each Task and Indicate Percent of Time and Identity each function as essential or marginal by placing an E or M next to the % of time for each task. Essential functions are the primary job duties for which the position was created and that an employee must be able to perform, with or without reasonable accommodation. A marginal function is a peripheral, incident of minimal part of the position.

No. Each Task and Indicate Percent of Time	E or M	
		This is specialized, professional work in recordkeeping systems analysis and electronic records management and preservation policy analysis, with statewide scope and application. The Kansas State Historical Society is making a critical transition from a paper-based records management and archival program to a program that manages and preserves digital government records in a trusted digital repository. This position requires an individual with a thorough understanding of traditional records management and archival practices as well as knowledge of the complex issues involved in electronic records management and preservation. The work is of a highly diverse and/or complex nature characterized by a broad range of activities and frequently changing conditions, situations, problems, and standards/best practices. The work requires considerable analytical thought applied to the origination of ideas, techniques and programs for solving technical problems, complicated situations, and resource reductions. The employee must exhibit independent judgment and participate in major program changes or policy decisions.
25%	E	**Information Technology Project Plan Review** In accordance with the provisions of Information Technology Executive Council Guideline 2400A, the electronic records archivist: • collaborates with Kansas government agencies preparing high level and detailed information technology project plans for submission to the appropriate branch Chief Information Technology Officer (CITO) to analyze the government records impacted by the proposed IT project; • determines whether proposed CITO-reportable IT projects impact records with long-term (10+ year retention) value; • ensures that the proposed CITO-reportable IT project plan includes appropriate provisions for managing and preserving long-term records, including the transfer of permanent records to the Kansas Enterprise Electronic Preservation (KEEP) trusted digital repository; • estimates the tasks, level of effort, and costs required to ingest, preserve, and provide access to permanent records transferred to the KEEP trusted digital repository; • works, as needed, with Kansas government agency staff to incorporate KEEP ingest costs into proposed CITO- reportable IT project budgets; • prepares electronic recordkeeping analysis reports and approval letters on proposed CITO-reportable IT projects for the State Archivist, whose approval is required for all CITO-reportable project plans; • participates, as needed, in CITO-reportable IT project execution to assist with records analysis, KEEP ingest planning, and other records-related tasks.
25 %	E	**Electronic Recordkeeping Systems Analysis and KEEP Ingest Coordination** The electronic records archivist works with Kansas government agencies to promote use of the KEEP System trusted digital repository and to coordinate the transfer of permanent records into the KEEP digital archives. The employee: • identifies Kansas government agencies that have permanent electronic records eligible for transfer to the KEEP digital archives; • contacts and presents the value of the KEEP trusted digital repository to Kansas government agencies that have permanent electronic records; • prepares recommendations for the State Archivist concerning the feasibility, level of effort, and costs associated with transferring, preserving, and providing access to specific permanent Kansas government records in the KEEP digital archives; • negotiates and administers submission agreements with Kansas government entities to specify the requirements for the transfer of permanent electronic records to the KEEP trusted digital repository; • communicates custom records transfer, ingest, preservation, and access requirements to KEEP system technical staff; • performs quality assurance on permanent records transferred to the KEEP digital archives to ensure compliance with submission agreements and KEEP policies and operating procedures.

25% 15% 5 % 5 %	E E E M	**Records Management Consulting (Analog and Digital Records)** • Promote the adoption of records management methods and best practices for records in electronic, paper and other formats in compliance with applicable records laws. • Analyzes business processes to determine agency functions and the resulting records series and information systems to develop records retention and disposition schedules. • Works with state agencies to develop and then participates in the review of Electronic Recordkeeping Plans detailing strategies for ensuring that long-term electronic records (10+ year retention) are managed and preserved for approved retention period. • Prepares and revises retention and disposition schedules and drafts appraisal reports for presentation to the State Records Board. This activity requires analytical thought to determine which government records have enduring value either for legal, administrative, or historical value. Incorrect choices could mean that records with enduring value are not preserved or that resources are invested in preserving records with that lack enduring value. The impact of such choices may not be immediately obvious. • Evaluates, inspects, and proposes new or revised agency recordkeeping practices. • Provides information on laws and policies related to records retention and disposition. • Works with others to develop enterprise guidelines and best practices, generally for the management of electronic records. • Produces and presents written and multimedia training materials on records and information management, including electronic records management and preservation. • Develops and maintains good working relationships with state agency staff. **Electronic Records and Information Policy Planning and Development** • Participates in policy planning and development of the KEEP digital archives through: o development and maintenance of the KEEP Policy Framework and KEEP operating procedures; o preservation planning to ensure long term access to records maintained in the KEEP digital archives; o promotion of expanded use of the KEEP system among state agencies and other levels of Kansas government. • Participates in digital information policy planning and development at the enterprise level for state government through: o staff support for the Electronic Records Committee, an advisory group to the Information Technology Advisory Board and the State Records Board; o participation on special task forces dealing with specific electronic records and information management issues. • Works with state agency program managers, information technology staff, and records officers to develop, implement, and periodically evaluate policies, guidelines, and best practices to promote effective electronic records and information management and preservation in Kansas government **Standards and Best Practices** • Studies best practices from electronic records management and digital preservation initiatives around the world and assesses their applicability to Kansas state government. • Serves as a knowledge source on rapidly changing national and international standards and best practices related to electronic records management and digital preservation and recommends agency action to anticipate developing needs. **Miscellaneous Related Duties** Other related duties may include but are not limited to: • serving on intra- and inter-divisional committees, task forces, and teams; • delivering presentations to a variety of groups; • enhancing professional knowledge and skills by o studying professional literature in the fields of records management, information technology, digital preservation, archives, government, and history; o participating in regional and national archives and records management professional

Appendix C: Suggestions for Modifying Statutes, Policies, Procedures and Guidelines to Address Digital Preservation Requirements and Capabilities

The objective of the recommended changes in this Appendix is to empower the development of a robust digital preservation environment for the State of North Dakota government records. They leverage existing mandates and information systems governance structures but supplement them with expanded capabilities for addressing digital continuity issues and strategies.

Expand Duties and Influence of the State Archivist

The statutory authority for the North Dakota State Archives is ND 55-02.1 Archival Resources and State Archivist. These duties should be expanded to include the authority of the State Archivist to:

- Establish a Digital Preservation Technology Watch Program that monitors developments in new technology neutral open standards and other digital preservation community practices
- Advise the repository operator (ITD) regarding the impact that changes in standards and digital preservation community practices have on the State Archives' digital preservation repository and collections
- Authorize the state agencies that hold electronic records of historical value required for operational purposes to retain them in a conforming ISO 14721 information system
- Serve as Co-Chair of a newly established Digital Preservation Working Group that will identify statewide digital preservation issues, recommend digital preservation priorities, including standards, urge digital preservation collaboration between and among agencies, and support an ISO 14721 conforming digital preservation repository

Update State Archives Procedures

Current State Archives procedures are primarily paper-based and must be revised to be useful in addressing electronic records of historical value. All procedures should be reviewed and revised in accordance with the Digital Preservation Policy Framework when it becomes available.

- **Authority**: Revise to include recommendation that State Records Management institute a requirement for agencies to identify records of permanent historical value at or near the time that records are created or received; requirements should be incorporated into Records Management Guidelines and training
- **Acquisition**: Revise to include an electronic version of State Archives Receipt (SFN 13351) that can be incorporated into ISO 14721 conforming Submission Information Packages (SIPs)
- **Transfer**: Add a new section that includes ISO 14721 ingest functions, specifications, and tasks for electronic records
- **Transfer**: Add references to ITD File Transfer Protocol and Secure File Transfer System

- **Transfer**: Request that State Records Management incorporate transfer requirements into Electronic Records Management Guidelines, Record Series Descriptions, Records Retention Schedule Approval forms, and training
- **Processing, Arrangement and Description**: Recast to describe the processing features and tasks of the ingest function with a special emphasis on metadata that captures descriptive content
- **Accessioning:** Recast or add a new section that delineates processioning procedures that are appropriate for electronic records
- **Reappraisal:** Review this section and determine what changes, if any, are appropriate for electronic records
- **Arrangement and Description**: Recast or add a new section that is appropriate for electronic records
- **Acquisition:** Develop new acquisition guidelines for electronic records that incorporate the Digital Preservation strategy and policy framework

Update Information Technology Department Statute

The statutory authority for the North Dakota Information Technology Department (ITD) is ND 54-59. This statute is comprehensive but it does not reference the critical role of ITD in supporting digital continuity for government records. The statute could be revised to include the following:

- Review 54-59.05, Powers and Duties of Department to identify sections where it is appropriate to reference an enterprise approach to electronic records management and digital preservation
- Review 54-59-11.1, Information technology project planning, and consider expanding this section to include digital continuity planning
- Add a new section that authorizes creation of a Digital Preservation Working Group co-chaired by ITD and the State Archivist that would include tasks such as:
    - Develop an enterprise approach to digital preservation activities within and across state agencies
    - Ensure that proposed information technology procurement projects take into account electronic records management records guidelines, especially authorized retention schedules, and a proposed digital preservation policy framework
    - Issue an annual report to the Governor detailing problems and progress in implementing a standards-based digital preservation repository

Update ITD Guidelines, Policies, and Procedures

ITD guidelines, policies, and procedures offer a comprehensive governance infrastructure that supports collaboration across discipline boundaries, promotes interoperability initiatives among and between different but related systems and applications, maximizes efficiency and effectiveness, and minimizes costs through reduction of redundancy of services. **Tournesol recommends updating these guidelines, policies and procedures to address electronic records management and digital preservation lifecycle issues, including a conforming ISO 14721 digital preservation repository where appropriate, in order to facilitate a broad base of guidance for agencies and promote accountability and transparency for the use of state IT resources.**

Update Electronic Records Management Guidelines

This is a comprehensive document that provides guidance on a variety of topics related to Electronic Records Management. Overall, it is a useful document but it requires substantial updating to be in alignment with life cycle management principles and with digital preservation requirements, where appropriate. The proposed revisions and expansions identified below are suggestive and should not be considered as a substitute for a major rewrite.

- Review and revise Introduction 1.
  - It is not such a matter of programs used to create but rather the obsolete file formats
  - Use of "digitized data" is extremely limiting and is inconsistent with the broader goals of these guidelines
- Review and revise 2. Background 4. To include integrity (not the same as security)
- Review and revise What is Electronic Records Management
  - Specify that mitigation of technology obsolescence is the key
- Review and revise Electronic recordkeeping systems criteria technical documentation
  - Update physical description of records layout in terms field, which is more appropriate for statistics reports from the 1970s and 1980s
  - Provide additional detail on how to map tables in relational databases to records series
- Review and revise Electronic Records Management Systems
  - Emphasize the importance of conformance with DoD 5015.2 [NOTE: ITD's FileNet implementation does not currently include the Records Management Component. Without it FileNet does not conform to DoD 5015.2.]
- Review and Revise 5. Using Electronic information issues
  - The context requires authenticity not authentication
  - Update the definition of Migration with an emphasis on interoperability across technology platforms and technology generations
- Review and revise Selection of Electronic Records Storage Media, 1
  - Clarify meaning of "usable format" in the context of storage media/device
- Review and revise Selection of Electronic Records Storage Media, 3
  - Clarify meaning of removable data storage devices, which in this context appears to include magnetic tapes and portable disk drives. Consider using the text in 6. Media Controls
- Review and revise Maintenance of Electronic Records, Media Controls

    - Prohibit the use of CD, DVDs, and flash/thumb drives in this context
- Review and revise Maintenance of Electronic Records, Systems
    - Include mapping of relational databases, identifying electronic records of historical value at or near the time of their creation or receipt, and capturing records of historical in preservation ready formats
- Review and revise Retention of Electronic Records, 3.
    - Add more procedures, including transformation of file formats to preservation ready formats
- Before Security add a new section on integrity of electronic records and an electronic chain of custody, including appropriate metadata
- Review and revise 9. Security of Electronic Records so that it excludes integrity protection (see previous bullet)

Update Records Management Program Implementation Guidelines

The proposed revisions and expansions identified below are suggestive and should not be considered as a substitute for a major update.

- Review and revise Records Inventory
    - Add a section on an electronic records systems and applications inventory with special attention to relational databases
    - Identify systems and applications that produce born digital records that have no official paper based counterpart
- Review and revise as appropriate Records Series Description
    - Assess how well paper based records series descriptions work with born digital records
    - Consider revisions as appropriate
- Review and revise Appraising Records
    - Upstream appraisal of records in state agencies at or near the time of approval of new systems and applications
    - Map relational database tables to records series at the time of design and updating of relational databases
- Review and revise as appropriate Inactive Records
    - This section is all about paper records and should be modified to incorporate guidance on inactive electronic records
- Participate in the review of the Procedure to Transfer Records to the State Archives
    - This transfer protocol is designed exclusively for paper based records
    - Add a section on the transfer of electronic records to the State Archives

Update Records Disposal Procedure

- Review and revise Procedure for Annual Records Disposal
    - Define the procedure for how the disposal of electronic records will be executed

- Define the procedure for how the disposal of relational database tables that are eligible for disposal

Identify Digital Preservation Issues Associated with Geographic Information Systems

This is a useful site that delineates lines of collaboration and mechanisms for sharing of data and information between and among GIS stakeholders for as far into the future as may be required. The GIS Hub is a repository for geospatial information and has a general fund appropriation status. This initiative in concert with Enterprise Architecture may provide models for an enterprise digital preservation program that has the strong and highly visible support of state government leadership.

- In conjunction with the GIS Manager and GIS Technical Committee and the Digital Preservation Working Group identify common digital preservation issues and concerns

Update Policy: Document Management (DMT003-06.1)

This brief policy document was issued in 2006 and therefore it is out of date. In addition it does not recognize that a Document Management System may contain records of historical value that must be treated differently than records of temporary operational value. In its current state its guidance is not useful.

- This policy statement should be revised to include the following:
  - Review updated Electronic Records Management Guidelines and revise as appropriate
  - Review Digital Preservation Policy Framework when available and incorporate relevant guidance

Replace Policy: Databases (DIT001-04.1)

This policy was issued in 2004 and has not been revised. It requires use of databases included in Approved Databases. It specifies that databases will be consistent across the enterprise and that "the quality, reliability and integrity of the data must be maintained. This policy document does not address electronic records management issues such as mapping relational database tables to records series and their associated retention period or ensuring access to records in tables that may be required for operational purposes for decades as database technologies change. Nor does it provide guidance on how "pruning" tools may be used to delete digital information and objects in database tables that are eligible for destruction.

- This policy should be withdrawn or completely rewritten to be in alignment with updated Electronic Records Management Guidelines and the future Digital Preservation Policy Framework

Replace Policy: Digital Imaging (DMT001-04.1)

This digital imaging policy, which was issued in 2004 identifies seven imaging standards and specifies that if a record has a permanent retention the minimum scanning resolution is 300 dpi. Otherwise, the minimum accepted scanning resolution is 150 dpi. Written documentation should be in place that ensures that the scanned images meet the evidentiary requirements of federal and state Rules of Evidence. This policy document is out of date with regard to standard image formats, the recommended scanning resolution, and quality control procedures. The latter is important for meeting federal and state rules of evidence. Its stated purpose is inconsistent with the current rationale for digital scanning projects and programs.

- DMT001-04.1 should be withdrawn and completely rewritten drawing upon:
  - The National Archives and Records Administration, Technical Guidelines for Digitizing Archival Materials for Electronic Access: Creation of Production Master Files – Raster Images
  - The digital imaging standards and best practices of the Minnesota State Historical Society

Replace Standard: Records Migration (DMT004-04.1)

DMT004-04.1 was issued in 2004 and states that "Records will be provided to ensure business continuity and to meet business and regulatory requirements" and that record owners must be able to "provide a proven way to migrate records to a format that can be accessed with available technology."

- IDMT004-04.1 should be withdrawn and completely rewritten so that it is in alignment with updated Electronic Records Management Guidelines and the future Digital Preservation Policy Framework

Appendix D: Three Information Life Cycle Models

Records Management Life Cycle

The Society of American Archivists (SAA) defined the life cycle model most often used by North American archivists and managers since the 1960's[10]:

> "This model portrays the life of a record as going through various stages or periods, much like a living organism. In stage one, the record is created, presumably for a legitimate reason and according to certain standards. In the second stage, the record goes through an active period when it has maximum primary value and is used or referred to frequently by the creating office and others involved in decision making. During this time the record is stored on-site in the active or current files of the creating office. At the end of stage two the record may be reviewed and determined to have no further value, at which point it is destroyed, or the record can enter stage three, where it is relegated to a semi-active status, which means it still has value, but is not needed for day-to-day decision making. Because the record need not be consulted regularly, it is often stored in an off-site storage center. At the end of stage three, another review occurs, at which point a determination is made to destroy or send the record to stage four, which is reserved for inactive records with long-term, indefinite, archival value. This small percentage of records (normally estimated at approximately five per cent of the total documentation) is sent to an archival repository, where specific activities are undertaken to preserve and describe the records.
>
> The life cycle model not only describes what will happen to a record, it also defines who will manage the record during each stage. During the creation and active periods, the record creators have primary responsibility for managing the record, although records managers may well be involved to various degrees. In the semi-active stage, it is the records manager who takes center stage and assumes major responsibility for managing the records. Finally, in the inactive stage, the archivist takes the lead in preserving, describing, and providing access to the archival record."

[10] http://www2.archivists.org/glossary/terms/l/life-cycle

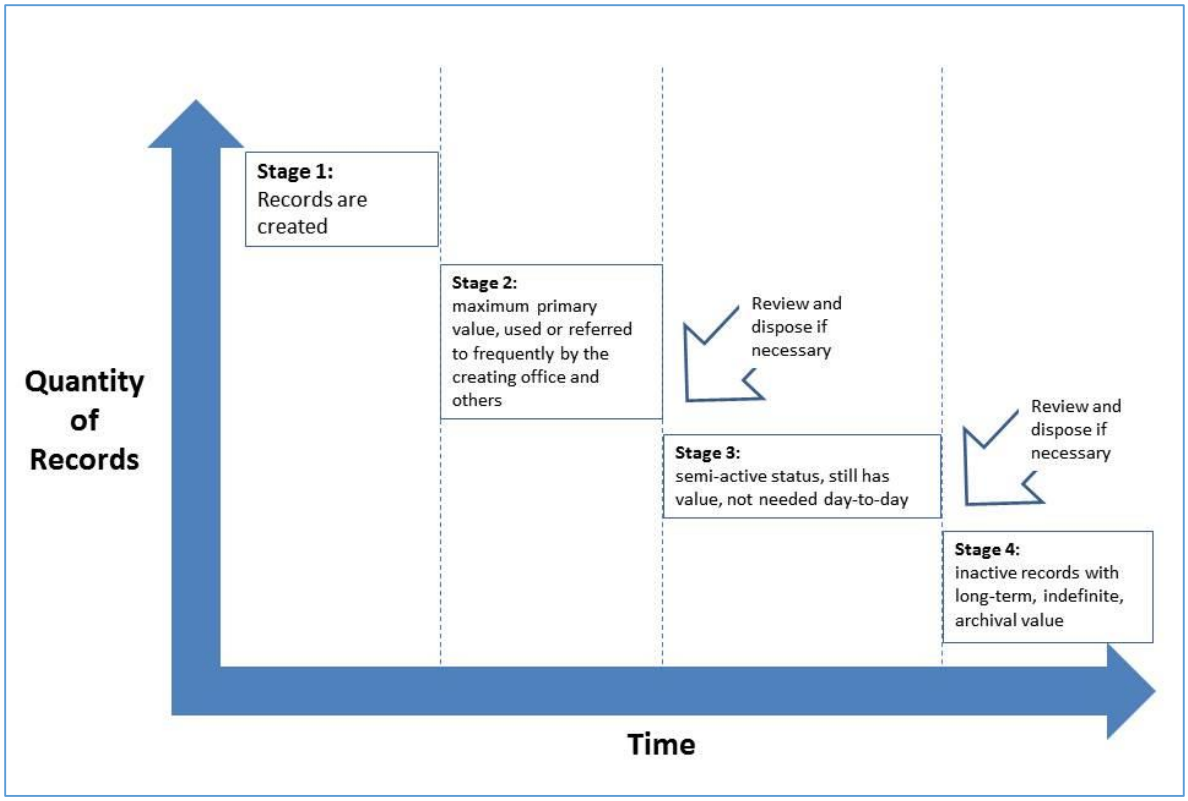

Figure 9. Life Cycle Stages of Records

This is an elegant and very simple model with just four stages. The role of the record's owners and custodians are defined at each stage. Staff members of ITD and the State Archives were familiar with the concepts embodied by the SAA records life cycle model. The simplicity of this life cycle model obscures the processes needed to guide records through each of these stages. Those processes also are well-documented in the Digital Curation Center (DCC) Curation Life Cycle Model.

Digital Curation Center (DCC) Curation Life Cycle Model

The Digital Curation Center was launched by a United Kingdom consortium comprising the Universities of Edinburgh and Glasgow (which together hosted the National e-Science Center), and UKOLN at the University of Bath –to address challenges in digital curation that required the resources of multiple institutions or disciplines. The digital curation life cycle is a much more elaborate model focusing on the activities needed to preserve information throughout its life.

The two major distinguishing features of the digital curation life cycle model are:

1. The model focuses on digital objects that could be scanned images, emails, reports in any format, or even objects contained in databases.
2. The model represents a continuous, recurring set of processes needed to ensure the continued usability of digital objects in the preservation repository.

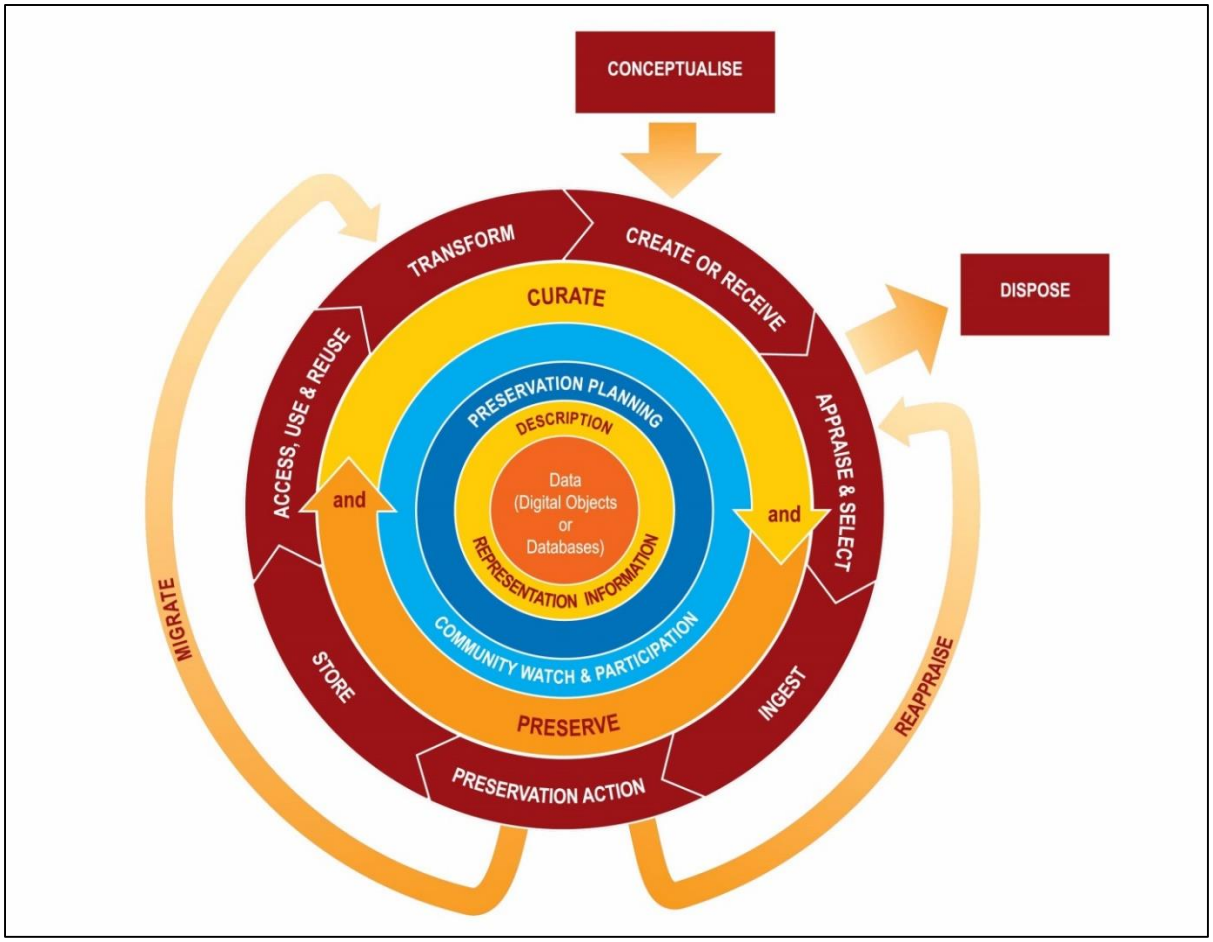

Figure 10. DCC Curation Life Cycle Model (Source: http://www.DCC.ac.uk)

Key terms in the Digital Curation Life Cycle Model and potential applicability to the North Dakota electronic records management environment and digital preservation repository are described below.

Table 12. Curation Processes and Potential Application for North Dakota

Curation Life Cycle Model Processes	Potential Application for North Dakota
Conceptualize: Conceive and plan the creation of digital objects, including data capture methods and storage options.	The conceptualize step would apply to work performed by the Enterprise Architecture Board as it reviews system proposals. The proposed Digital Preservation Working Group could endorse efforts of the Records Management Program and the State Archives to proactively identify records of archival value and conduct preservation planning.
Create: Produce digital objects and assign administrative, descriptive, structural and technical archival metadata.	Creation requires collaboration between the records owner, application/system administrator, data architect, and records coordinators.
Access and use: Ensure that designated users can easily access digital objects on a day-to-day basis.	Security and use requirements must be specified and enforced in the operational and preservation environments.
Appraise and select: Evaluate digital objects and select those requiring long-term curation and preservation. Adhere to documented guidance, policies and legal requirements.	Appraisal and scheduling are performed by the State Archivist with support from the Digital Preservation Working Group.
Dispose: Rid systems of digital objects not selected for long-term curation and preservation. Documented guidance, policies and legal requirements may require the secure destruction of these objects.	Disposition of electronic records should be performed by software systems carrying out rules based in records retention schedules developed by agencies in collaboration with State Records Management and automated wherever practicable.
Ingest: Transfer digital objects to an archive, trusted digital repository, data center or similar environment, adhering to documented guidance, policies and legal requirements.	Ingest of electronic records into official government records systems as well as into the State Archives' digital preservation repository should be done in accordance with standards and documented processes and procedures.
Preservation Action: Undertake actions to ensure the long-term preservation and retention of the authoritative nature of digital objects.	Preservation actions would be administered by the State Archivist in collaboration with the digital preservation repository system operator (ITD) in accordance with the proposed Digital Preservation Policy Framework.
Reappraise: Return digital objects that fail validation procedures for further appraisal and reselection.	The State Archivist would notify state agencies and local government entities regarding electronic records that fail submission procedures and standards.

Curation Life Cycle Model Processes	Potential Application for North Dakota
Store: keep the data in a secure manner as outlined by relevant standards.	The digital repository would be responsible for meeting archival storage standards.
Access and Reuse: Ensure that data are accessible to designated users for first time use and reuse.	The State Archivist is responsible for ensuring that materials are available (or restricted) in accordance with the terms of negotiated Submission Agreements with Records Producers.
Transform: Create new digital objects from the original, for example, by migration into a different format.	The **Transform** step is required as part of the data management function to ensure the viability of digital objects over successive generations of technology.

Geospatial Information System (GIS) Life Cycle Model

A third life cycle model for consideration is the Geospatial Multistate Archive and Preservation Partnership (GeoMAPP) developed for geographic information systems (GIS). The GIS life cycle model presented in Figure 11 is important to consider for two reasons: (1) it assigns even more specific roles and tasks than the DCC life cycle model, and (2) GIS is an important collaborative preservation effort for the State of North Dakota and all other states.

North Dakota has multiple GIS data providers (e.g., Oil & Gas, State Water Commission, Public Service Commission, Game and Fish Department) as well as many consumers. A GIS Clearinghouse (i.e., the GIS Hub) also exists, but the process depicted in Figure 3 below breaks down at the point of transferring preservation information to the State Archives, and with regard to staging and preservation activities by the State Archives.

Tournesol recommends that the proposed Digital Preservation Working Group collaboration with the GIS Working Group to identify and address the preservation of GIS datasets as a pilot project once the digital preservation repository is operational. Several other State Archives currently ingest and preserve GIS datasets and can provide useful models for North Dakota to consider.

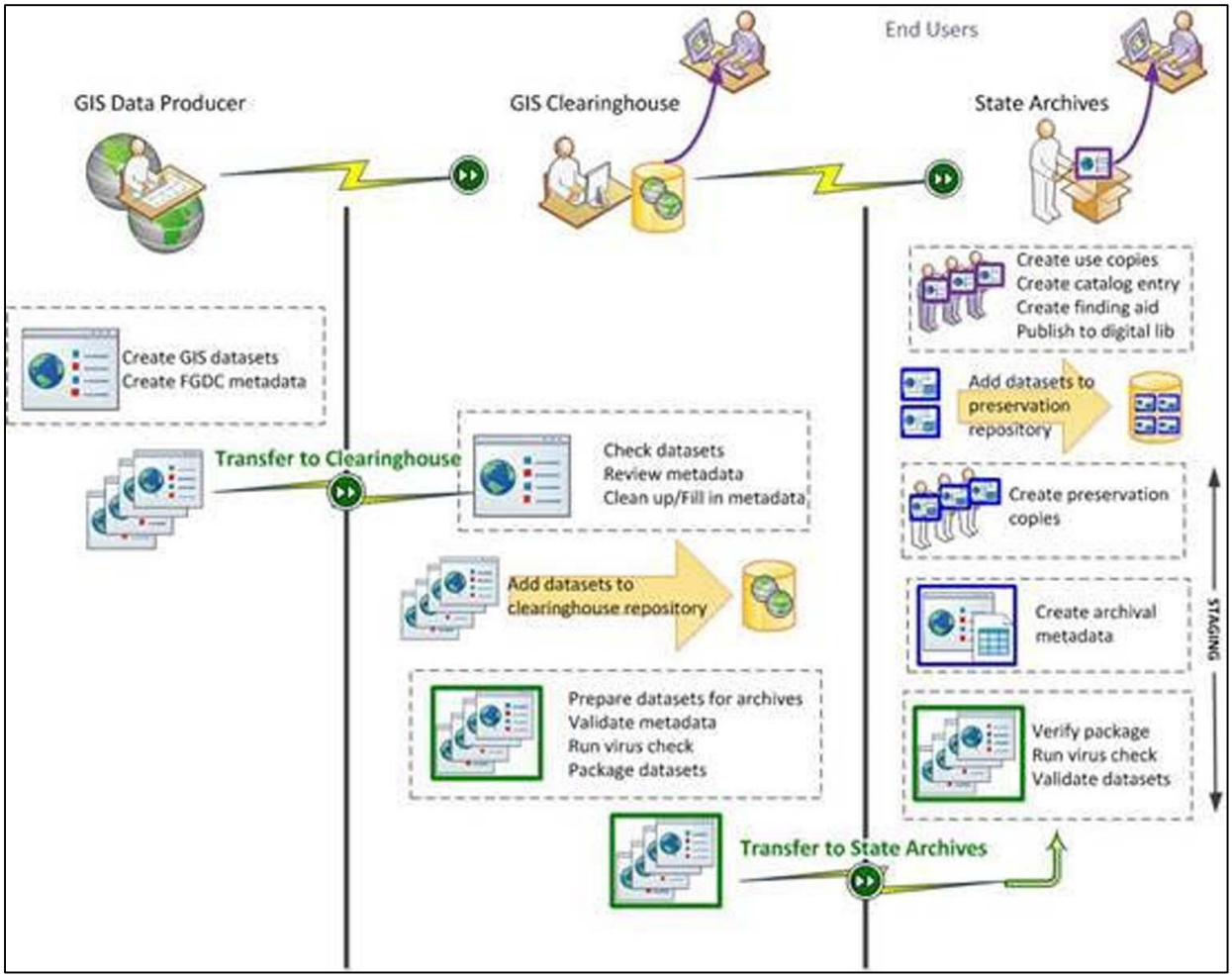

Figure 11. Geospatial Multistate Archive and Preservation Partnership (GeoMAPP) Life Cycle Model (Source: http://www.GeoMAPP.net)